REPORT
COMMISSIONER OF AGRICULTURE

NORTH CAROLINA DEPARTMENT OF AGRICULTURE
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NORTH CAROLINA

REPORT

OF THE

COMMISSIONER OF AGRICULTURE

OF THE

STATE OF NORTH CAROLINA.

1902.

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OF
NORTH CAROLINA.

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REPORT OF THE COMMISSIONER.

His Excellency, CHARLES B. AYCOCK, *Governor*.

In the past the law has required the Board of Agriculture to report to the Legislature. Two years ago, for reasons then given, it devolved upon me to prepare it somewhat hastily. The last Legislature so changed the law as to require the Commissioner of Agriculture to "transmit to the General Assembly at each session a report of the operations of the Department, with suggestions of such legislation as may be deemed needful." I have therefore the honor to transmit through your Excellency to the Legislature my second biennial report.

I apprehend that it was the purpose of the Legislature to secure a report by which the operations of the Department might be reviewed by that honorable body, in order to enable the members to judge, each for himself, of the value of its work, and whether or not it was accomplishing those things to which it had been appointed.

The operations of the department are directed, and its policies fixed by the Board of Agriculture. This Board at present consists of fifteen members, there being one member from each Congressional District, appointed by the Governor and confirmed by the Senate, the Commissioner, who is *ex officio* chairman, and four other members, whose terms expire in March, 1903, and for whose succession no provision is made. Of the ten members from the Congressional Districts, the terms of three expire in March next; those from the Second, Fifth and Eighth Districts, and whose successors are to be appointed for terms of six years.

The Board meets twice a year for the transaction of business, and oftener if called together by the Chairman. During the past two years I have had occasion but one time to call the Board together in extra session, and this was on account of pressing business in connection with the A. and M. College, which was placed in control of the Board of Agriculture by the last Legislature.

INSPECTION AND ANALYSIS OF FERTILIZERS.

The primary object and main business of the Department of Agriculture is the inspection and analysis of commercial fertilizers, which are coming to be used in such vast quantities by the farmers of the State.

As an indication of the increasing trade in fertilizers the sales by the year since 1897 are here appended:

1897	214,371.5 tons.
1898	245,511.75 tons.
1899	244,808 tons.
1900	276,238 tons.
1901	339,941 tons.
1902	330,714.75 tons.

Showing an increase of sales during the last six years of over 50 per cent.

Pricing the fertilizers sold at an average of $18.00 per ton, the results indicate the vast sum of nearly six million dollars, which the farmers and truckers of the State invest in fertilizers before the crops are planted.

No argument is needed for their protection in this trade. Its very nature renders them helpless. Only by a system of constant inspection, aided by the analytical work of the chemical laboratory, can the necessary protection be afforded.

Before the laws governing the fertilizer trade were enacted, and during the early days of their operation, undoubtedly frauds were practiced by dishonest and irresponsible dealers and manufacturers. It is gratifying to be able to say now that under the stringent regulations of the department there are few serious infractions of the law, and the purpose of the manufacturers is evident to comply with the regulations. Indeed, these laws are a protection to the honest manufacturer as well as the purchaser.

Every manufacturer is required to register each year all the brands which he proposes to sell in the State, giving therewith a guarantee of the chemical constituents of each brand. These registrations are published each season in the *Bulletin* of the Department of Agriculture, and with them for comparison are also published the results of the analyses of the samples taken by the inspectors as rapidly as the chemists can determine them. The farmer can thereby see at a glance whether the analysis of the particular brand he has used confirms the claim the manufacturer has made in registration of that identical brand. If not, the law provided for recovery of damages; but a still greater safeguard to the farmer consists in the consequent distrust of the brand and injury to the manufacturer's trade.

I believe, as already stated, there is a general purpose on the part of the manufacturers to comply with the law, and with the regulations adopted by the Board of Agriculture, and not much friction of late has resulted in their enforcement.

But as time progresses and experience increases, some new phase of this great and increasing and complex trade presents itself, and some changes in, or amendments to the law become necessary. Some of these of minor consequences, and effecting rather the machinery of the law, or making clearer its meaning, will be presented to the Legislature, with suggestion of such changes as seem desirable.

One or two of greater importance I desire to refer to here.

Along with the growth and development of the fertilizer trade there has been an increasing number of brands, until last year 954 brands were registered. Of those on sale, several thousand samples were taken, and of the samples some 1,232 analyses were made by the chemists. Many of these brands were formerly duplicates of others, misleading to the farmers, and sometimes working injury to the originators of a popular brand. For instance, a manufacturer might make a "run" on a certain brand—his competitor would adopt the same brand, making possibly the same claim of fertilizing ingredients, in order to share in the favor accorded the original; or, more likely, after adopting the name he would cheapen the claim, and be able to that extent to undersell the originator, for it is unfortunately too true that many of our farmers buy fertilizers by brand name, and not by guaranteed

percentage of fertilizing ingredients. To correct this evil, the last Legislature, at my suggestion, amended the law so as to forbid a duplication of brands. It is sometimes extremely difficult to define a "duplicate," as the significance of a brand consists frequently in one or two leading words, and the manufacturer understands very well where to use big type.

But along this same line of brand names occurs another somewhat different evil, over which I have exercised authority under the general provision of law controlling the trade, but which I will ask the Legislature to set forth more explicitly.

Quite a number of brands are offered for registration of high sounding words, whose fertilizing properties are only ordinary. For instance, "High-grade Special Premium All Crop Premium Fertilizer," 8—2—1; a great big name, with only a claim of ingredients the lowest allowed by the law. This is one of the "tricks of the trade," and should be explicitly prohibited by law; and further, the law should specify minimum percentages of phosphoric acid, ammonia and potash in fertilizers claiming to be "special," or "premium," or "high grade," for tobacco, or cotton, or truck, or potatoes, or for any other crop, so that their claims of ingredients should be worthy of their names, and not calculated to mislead or deceive the ignorant purchaser.

The law should forbid the transportation by railroad or boat of any fertilizers unbranded, or not having attached the tax tags, and any officer or agent of railroads or boats wilfully violating the law should be made personally liable, and guilty of a misdemeanor, subject to such exemption as might be provided by the Board of Agriculture.

The Department of Agriculture derives its support from a tonnage tax of twenty cents, and from the proceeds of this tax its work is conducted. Some years ago the constitutionality of this tax was tested in the courts, and was finally declared by the United States Supreme Court, in substance, to be constitutional as a police regulation of the fertilizer traffic, and incidentally applicable to other objects named in the law. The revenue derived from this tax amounted during the last two fiscal years to $67,988.24 for 1901, and to $66,142.97 for 1902. The Secretary of the Board will furnish the usual statement of disbursements to be attached hereto.

FINANCIAL REPORT.

The balance in the treasury at the beginning of the fiscal year ending November 30, 1901, was	$51.36
Receipts for the fiscal year ending November 30, 1901, were	$67,988.24
The receipts for the fiscal year ending November 30, 1902, were	66,142.97
Balance in the treasury at the close of the fiscal year ending November 30, 1902, was	301.26

The disbursements of the Department have been made from the office of the Commissioner. The items have been carefully scrutinized, from time to time by the Finance Committee of the Board of Agriculture, and compared with entries made on the books of the State Treasurer, and found to be correct.

The warrants have been examined, compared with the books of the Treas-

urer, and cancelled by the Legislative Committee, whose duty it is to examine all the finances of the State.

Respectfully submitted, T. K. BRUNER,
Secretary.

TAX ON COTTON-SEED MEAL.

The law grants discretion to the Commissioner, with the advice and consent of the Board of Agriculture, to exempt from tonnage tax such materials as may be deemed expedient. Under this provision cotton-seed meal has been exempted, until last year, when the exemption was withdrawn, and this meal became subject to tax when used as a fertilizer. This action became necessary on account of the frauds and adulterations discovered in most of the meal shipped into the State, induced probably by the increase in price of our meal.

I am sure that this was wise action. There is some difficulty, of course, in determining meal to be used for fertilizing purposes and meal to be used for food. A label is required in either case, stating the purpose, and if to be used as fertilizer; the tax tag is also attached. It would serve an excellent purpose, and greatly simplify the supervision of the traffic in cotton-seed meal if all meal, whether to be used as food or fertilizer, were subjected to the tax requirements and provisions for inspection and analysis. It is as necessary in its use for food as for fertilizer. The mills in the State have for the most part complied with the spirit of the law, some of them wisely using the tax tags on all their products, without regard to its ultimate use. The tax is so small—only one cent on a hundred pounds—the tag really pays the miller in advertising the value of his product.

The tax receipts for the past year, include the amount from this source, $3,058.66, which does not appear in the receipts of any previous year.

TRUSTS AND COMBINATIONS.

The Commissioner is directed by law to "report to the Solicitors, and to the General Assembly, information as to the existence and formation of trusts or combinations in fertilizers or fertilizing materials which are, or may be, offered for sale in this State, whereby the interest of the farmer may be injuriously effected."

I beg here to incorporate, and make a part of this report, my report upon the same subject to the last General Assembly, referring to such changes as have come to my knowledge since that time.

The Va. C. C. Co. is by far the largest combination manufacturing and dealing in fertilizers and fertilizer materials. This combination has been strengthened by the purchase or control of the following additional fertilizer factories during the two years, within the State:

Charlotte Oil and Fertilizer Co., Charlotte, N. C.
Goldsboro Oil Co., Goldsboro, N. C.
Selma Oil Co., Goldsboro, N. C. (Selma, N. C.)
Southern Chemical Co., Winston, N. C.
Rocky Mount Oil and Fertilizer Co., Rocky Mount, N. C.
Wilson Oil Mills, Wilson, N. C.

And without the State, it appears, the following:

American Fertilizing Co., Norfolk, Va.

There has been formed also a combination of cotton oil mills under the general name of Southern Cotton Oil Co., with many branch offices. It is commonly understood that this company belongs to, or is controlled by, the Va. C. C. Co.

The following oil companies doing business in North Carolina are now branches of the Southern Cotton Oil Co.:

Edgecombe Oil Company, Tarboro, N. C.

Fayetteville Oil Co., Fayetteville, N. C.

Conetoe Oil Co., Conetoe, N. C.

Gibson Oil Co., Gibson, N. C.

Other oil companies are:

Anson Oil and Ice Co., Wadesboro, N. C.

Chesterfield County Oil Co., Cheraw, S. C.

Cotton Oil and Fibre Co., Norfolk, Va.

Havens Oil Co., Washington, N. C.

New Bern Cotton Oil and Fertilizer Mills, New Bern, N. C.

Rowland Oil and Fertilizer Works, Rowland, N. C.

Tar River Oil Co., Tarboro, N. C.

N. C. Cotton Oil Co., Raleigh, N. C.

N. C. Cotton Oil Co., Wilmington, N. C.

N. C. Cotton Oil Co., Charlotte, N. C.

S. C. Cotton Oil Co., Columbia, S. C.

S. C. Cotton Oil Co., Greenville, S. C.

Besides the foregoing combinations, the following companies:

The Geo. L. Arps Co., Norfolk, Va.

The Columbia Guano, Norfolk, Va.

The Atlantic Chemical Co., Norfolk, Va.

All seem to be under control of the F. S. Royster Guano Co., of Norfolk and Tarboro, but not defined as branches.

The Lazaretto Guano Co., Baltimore.

Zell Guano Co., Baltimore.

Chemical Co. of Canton, Baltimore.

Are now controlled by the American Agricultural Chemical Co., of Baltimore.

There are perhaps one or two other instances of small and apparently independent companies being controlled by a larger one.

To what extent the fertilizer market has been influenced by these combinations it is impossible to say. Apparently all the fertilizer companies have an understanding as to the price of various grades of fertilizers sold. But prices of fertilizing materials have not varied during the two-year period more than might be claimed was due to the fluctuations of the market, and as prices of other commodities have varied.

The price of cotton-seed meal is higher than it had ever been until some three years ago, but very little higher than two years ago. Other ammoniates have for the most part kept a like pace. The same may be said of the phosphates; while the prices of potash salts controlled by a foreign syndicate are slightly lower.

As a partial remedy for the trust evils the Department has always advised the use of cow peas and other leguminous crops to supplant as far as possible the high-priced ammoniates, and, where practicable, the purchase and home mixing of other ingredients, by formulas composed by the State Chemist, to save the profits made by the factories on the mixed products.

The following table of prices of fertilizing materials for three years past will be of interest:

FERTILIZER PRICES FOR UNMIXED MATERIALS, IN RETAIL QUANTITY OF FIVE TONS OR LESS, FOR CASH AT FACTORIES.

JANUARY 1, 1899.	
Acid phosphate	$10.09
Kainit	11.14
Cotton-seed meal	19.25
Muriate of potash	44.81
Sulphate of potash	50.00
Dried blood	38.00
Tankage	25.10
Sulphate of ammonia	59.66
8—2—2 goods	15.70
JANUARY 1, 1900.	
Acid phosphate	12.55
Kainit	12.89
Cotton-seed meal	23.80
Muriate of potash	46.75
Sulphate of potash	50.80
Dried blood	38.07
Tankage	26.02
Sulphate of ammonia	66.43
8—2—2 goods	18.20
JANUARY 1, 1901.	
Acid phosphate	11.29
Kainit	12.27
Cotton-seed meal	25.00
Muriate of potash	46.91
Sulphate of potash	50.94
Dried blood	43.70
Tankage	28.81
Sulphate of ammonia	68.25
8—2—2 goods	17.70
JANUARY 1, 1902.	
Acid phosphate	10.99
Kainit	12.00
Cotton-seed meal	25.00
Muriate of potash	48.00
Sulphate of potash	49.60

Dried blood	$45.70
Tankage	28.62
Sulphate of ammonia	51.00
8—2—2 goods	17.91

The machinery of the Department consists for this branch of the work in a secretary, two clerks, stenographer and janitor, and of a sufficient number of inspectors to police the State, in actual service only during the seasons when fertilizers are being sold, and in addition to these, the State Chemist and his assistants.

In connection with the inspection and analysis of fertilizers, are the collection and analysis of foods, feeding stuffs, vinegar, cider, liquors and the like, in accordance with the pure-food law enacted by the Legislature of 1899. The results of chemical analyses of many samples taken in 1901 have been published in the *Bulletin* of the Department for September, 1902, and those for 1902 will be published in the January *Bulletin* for 1903. I beg to refer the Legislature to these bulletins as showing the progress made, and also the careful and comprehensive discussion of the subject in the report of the able State Chemist. I wish, however, to add my earnest commendation of the object of the law. The protection of our people from the shams and frauds, often deleterious to health, to be found in every market, and the protection of our animals from the miserable feed stuffs against which they are helpless to protest.

I hope the Legislature will, in its wisdom, provide more stringent regulations for the sale of food products of all kinds, both for man and for beast.

Besides the enforcement and supervision of the laws which have been, or may be, enacted governing the sale of commercial fertilizers and food products, the law enjoins upon the Department various other duties, some of which are of great importance to the State; none more so than "investigations adopted to promote the improvement of milk and beef cattle, and especially investigations relating to the diseases of cattle and other domestic animals," the publication of information relating to contagious diseases of stock, the power to quarantine infected animals, to regulate the transportation of stock into the State, or from one section of the State to another, the co-operation with the United States Department of Agriculture in establishing and maintaining cattle districts, or quarantine lines, to prevent the infection of cattle from splenic or Spanish fever (frequently called distemper and by other common names).

To execute the provisions of this section of the law, the services of a trained veterinarian are necessary. The former State Veterinarian, Dr. Cooper Curtice, resigned in September, 1900. For some months the duties of the office (outside of the veterinary practice itself) devolved directly upon me. In September, 1901, we were fortunate in securing, in conjunction with the Experiment Station, the efficient services of Dr. Tait Butler, a man eminent in his profession, and of wide knowledge of and practical experience in matters pertaining to it. Attached hereto is his valuable report, dealing largely with animal production in North Carolina.

Greater money loss from disease occur among cattle than in any other species of domestic animals. It has been ascertained beyond question that

the cattle tick is the prime cause of nearly all the losses. In conjunction with the United States Department of Agriculture, exempted districts and quarantine lines have been established, the purpose being twofold—to protect the cattle from contagion in those districts exempt from the tick plague, and to extend gradually the exempted districts, until the whole State shall become free. This is undoubtedly practicable wherever the no-fence law prevails. It is equally certain that the raising of cattle will be given a great impetus, especially in the eastern and middle eastern counties, and their value will be greatly enhanced.

According to the census of 1900 there were in our State 645,417 cattle, of all ages, valued at about $8,000,000.00, an average of $12.40 per head. A riddance of the tick plague means open markets to the North, which are practically closed now to Southern cattle, on account of quarantine lines. Prices would at once rise, and in a few years the number would rapidly increase and greatly improve. In some of the Northern States the average value of cattle is from $22 to $25 per head. This is not all owing to improved breeds. With the plague destroyed, and with all quarantine restrictions removed and Northern markets opened, our cattle values would be doubled.

It is gartifying to note an increasing interest in the State in the production of cattle and other stock, for it still remains true that every system of permanently successful agriculture must include in its economy the rearing of farm animals. I wish to call your attention especially to the discussion of this subject in the report of Dr. Butler, the State Veterinarian, and Dr. Kilgore, the Director of the Experiment Station, through whose efforts two carloads of full-blood Aberdeen-Angue cattle have been introduced into the State, with increasing demand for more. Our Eastern people have not fully realized the splendid opportunities they possess of rearing and feeding cattle for market. No section of the State can fatten beef, or, I may add, produce pork so cheaply. This is my conviction after several years of close observation of all the conditions. It is the fixed policy of this Department to encourage the raising of more cattle, and of a higher grade. There is room for it, need of it, and rich reward will follow.

ENTOMOLOGICAL.

The law enjoins upon the Department, "investigation relative to the ravages of insects, and the dissemination of such information, as may be deemed essential for their abatement, and the making of regulations for the destruction of such insects."

I present herewith, and commend to your careful study the interesting report of the State Entomologist, Mr. Franklin Sherman, Jr. It is a record of work, of unremitting zeal and watchfulness; but it is painfully apparent that the injurious insect pests are on the increase, and our people have not fully learned the best methods of combatting them. Mr. Sherman is doing a very useful and indispensable work, but will need help in the near future, or our orchard interests, now so promising, will be seriously jeopardized. I may mention in this connection that the Board of Agriculture has been seeking to encourage and develop the apple industry, especially in the West, seeking by the collection and exhibition of fine specimens, to make known to the world

the inviting opportunities of the mountainous sections of the State for their production.

Exhibits were made at the Paris exhibition in 1900, at Charleston last year, and at our own State fairs, all being under the capable management of Secretary Bruner. The collection of apples and pears at the last State fair especially was doubtless the most handsome and attractive ever seen in the State. This collection was inspected by Prof. L. H. Baily, of Cornell University; Col. G. B. Brackett, Pomologist, U. S. Department of Agriculture, perhaps the greatest authority on apples in America, and Fred. W. Taylor, of Nebraska, Director of the Department of Agriculture and Horticulture, at the St. Louis Exposition, who gave unstinted praise to the handsome collection, and commended the adaptability of the soil to the production of the highest quality of fruit. Large and increasing interests in commercial orchards are being made yearly, adding to the wealth of the State and the prosperity of the investors. I may quote here from a recent review of the Soil Survey, referred to elsewhere in this report, by Secretary Wilson. He says: "There is no more interesting development at the present time in the Atlantic Coast States than that of the fruit interest in the mountains of Virginia, North Carolina, Georgia and Alabama. From the work (of the soil survey) so far done in these States, it is clearly apparent that the soil has an important bearing on the different fruit crops, and the apple and peach soils can be identified and outlined as a basis for the intelligent development of these industries. Not only are certain soils adapted to apples, but certain apples do better on some soils than on others, and the same is probably true of other fruits.

"The North Carolina Department of Agriculture has co-operated very cordially and helpfully in the work, and it appears desirable to continue this co-operation, assigning a party there for nine months during the coming field season to extend the soil survey."

FARMERS' INSTITUTE.

Another important work of the Department is holding Farmers' Institutes. I am fully aware that the institutes have not enlisted the interest of the farmers to their fullest extent, nor reached their highest state of efficiency. But improvement has been made. The State is large, the season in which it is practicable to call farmers from their work is short, and the force for conducting the institutes is limited. But, notwithstanding these difficulties, the system is coming in more popular favor, the average attendance is better, and there are evidences of good results from the efforts made at the meetings. It is our constant aim to make them of greater value to the farmer, and to develop their social as well as their business features.

THE BULLETIN.

The publication of the *Bulletin* continues as required by the law. It goes monthly to more than twenty thousand farmers of the State, and the number is constantly increasing. Its influence is greater, and its hold upon the farmers stronger than ever before in its history. The cost of printing and mailing the *Bulletin* every month is considerable. I have under consideration a plan for issuing the *Bulletin* in pamphlet form, bi-monthly, or six times a year, and

supplementing its publication with press bulletins, dealing in matters of general farm interest, and to be offered the newspapers. The plan is not matured, but if, after further investigation, it seems advisable, I will ask the Legislature to make such changes in the law as may be necessary to effect the desired end. Included in my report to the last Legislature was such matter of permanent interest as the *Bulletin* contained, issued since I had taken charge of this office. To this report, and to be hereafter published with it, will be added such matter of permanent value as the *Bulletin* has contained during the two years past. When published I will have the pleasure of presenting a copy to each member of the Legislature, which, I trust, will be found of interest, even to those members who are not directly engaged in agriculture.

STATISTICS.

The Department is designated as the Department of Agriculture, Immigration and Statistics.

The matter of crop statistics is yearly becoming of more and more consequence as a factor in prices.

It is of the highest importance to farmers to secure correct information of the crop production in which they are interested, for the ruling price of crops are substantially fixed before the crops are housed, and these prices are based on the supposed amount of production. Take, for instance, the cotton crop. The purchasers have their agencies for ascertaining the probable output. They are interested in reports of large production, having an inevitable tendency to lower prices. A year or two ago the well-remembered Neill report over-estimated the crop by a million bales. This reacted to the advantage of buyers, and, notwithstanding the protest of the United States Department of Agriculture, and other reporters, it had a depressing influence for months upon the cotton market, causing losses to the cotton planters running into millions of dollars.

What we want is to know the truth, and, as far as possible, to get it.

The Department has a system of securing reports by percentages of comparison with other crop years, but this is not adequate or satisfactory.

The United States Department of Agriculture has a corps of reporters and agents securing estimates of yield, and the tabulated reports sent out by the Department are the most reliable of any furnished. But, in my judgment, the cotton States can lend material aid in securing correct estimates, not only of cotton, but of tobacco, corn and wheat.

I believe a simple and effective plan would be to furnish to the tax-listers of every township blanks prepared by the Department, requiring a sworn statement of every tax-payer of the acreage, as nearly as he can estimate, devoted to the said named crops of cotton, tobacco, corn and wheat the previous year, and the production of each crop; also, the amount of acreage devoted to these crops, and their condition for the current year.

I would exclude all fractions of an acre, and take no account of crops of less than two acres of corn, wheat or cotton, and of one acre of tobacco. The statistics thus taken should be returned and tabulated at this office. The additional work imposed upon the tax-lister would be inconsiderable, but

whatever time is necessary will be well used, and the lister is paid by the day for his services.

At the last meeting of the Association of Commissioners of Agriculture of the Cotton States, resolutions were adopted approving the plan proposed. I trust it will meet the favor of your Excellency, and the approval of the Legislature.

The need of statistics pertaining to the crops is much felt by truckers in the eastern part of the State. But here a different system must be adopted to be effective, and one which the Department has not the machinery to provide. For rapidly growing crops to be marketed fresh and green it is indespensable to have frequent information of the condition existing in other truck sections. Too much may be lost to our truckers by delay in marketing, or by false information from interested sources. Several States are involved. I have presented the matter to Secretary Wilson, who has it under advisement. I hope through the aid of our representatives in Congress to see a system adopted and controlled by the United States Department of Agriculture which will meet all the conditions existing, and prove of great value to the truckers.

IMMIGRATION.

A part of the work of the Department of Agriculture is the "inducement of immigration and capital." Since my last report Mr. John W. Thompson, who had the immigration work directly in charge, has resigned. The Board did not deem it expedient at the time to appoint a successor, and the work has devolved directly upon me. Mr. Thompson attended faithfully and zealously to the work, and at times with encouraging prospect of success. But many difficulties are in the way of turning the tide of immigration toward the South, and after all there may be doubt of the wisdom or desirability of introducing into our midst (even if practicable) a promiscuous foreign element. My efforts have been, for the most part, confined to securing the thrifty settlers from the North and Middle West, who may be seeking cheap lands and a mild and healthy climate. I receive many letters of inquiry concerning the State, and the rich opportunities offered for a livelihood in various industrial lines. These are carefully answered and much literature sent out. I beileve the efforts are bearing fruit.

CHARLESTON EXHIBITION.

Following the precedent established for many years on similar occasions, and with approval of your Excellency, the Board of Agriculture made an exhibit of the State's resources at the Charleston Exposition. For its size, and for the amount of money expended, some $9,000.00, our exhibit was generally conceded to be the best by all odds of any of the States represented.

For comparatively so small an outlay of money the exhibit could not have been made except for the aid of our splendid museum, which, during the years, has grown in value and interest, until it has become the pride of the State, and is a perpetual monument to the wisdom and patriotism of its founders.

TEST FARMS.

Dr. Kilgore, the State Chemist, discusses in his report the operations of the test farms, to which I referred in my former report. Their success, due to his

wise planning and careful supervision, has demonstrated their value, which will constantly increase, as time allows development. I beg to refer you to his elaborate report on this subject.

The law charges the Department "with such investigations as will best promote the improvement and extension of diversified farming, including the rotation of crops, the raising of home supplies, vegetables, fruit, stock, grasses, etc." This clause contains the true policy for the farmers of the State. A few here and there under exceptional circumstances may succeed by a one or two-crop system, but the great mass of the farmers of North Carolina need to raise their home supplies *first*, and then make as large sales crops as their circumstances will allow. This doctrine I have always advocated in farmers' institutes, in the *Bulletin*, in letters, in conversation—in season and out of season. The wisdom of it has been proven over and over, and it is extremely gratifying to believe that it has taken deep root in our farming policy.

The disastrous crop lien system has been uprooted, good crops of cotton and tobacco have been raised during the past year, and the farmers are probably freer of debt and in better condition than at any time since the war. By no other system can they defend themselves so successfully from the deep-laid schemes and machinations of the tobacco trust, or from the fluctuations of the cotton market.

Other duties are imposed upon the Department of Agriculture, including investigations relative to drainage, fishing interests, collection of statistics of the cost of farm fences and the like; but as none of these have been conspicuous in the operations of the Department during the past two years, no more than reference to them is necessary.

In March, 1901, an agreement was entered into by your Excellency in behalf of the State, and afterwards confirmed by the Board of Agriculture and the United States Geological Survey, to continue on a large scale the co-operative investigation of the soils of the State, begun the year previous, the results to be presented in sectional maps, exhibiting the character and location of the various soils. Under the terms of the agreement the survey should expend ten thousand dollars annually in the work, and the Department of Agriculture a like sum. The work was conducted through the summer and fall of 1901, but, before renewing it in 1902, it became apparent that the funds of our Department would not warrant so large an outlay. The government authorities very reasonably continued the prosecution of the work upon payment by the Department of certain expenditures already incurred, amounting to something more than eleven hundred dollars ($1,100.00), and the additional appropriation of five thousand dollars ($5,000.00), it being understood that the State should eventually expend an amount equal to the expenditure of the government; but this agreement might become void at any time upon failure of Congress to make sufficient appropriation in behalf of the survey, or the Board of Agriculture in behalf of the Department, to continue the work. In the meantime the topographers had considerably exceeded the soil men, and the Board thought it wise, and indeed positively necessary, for lack of funds, to ask a suspension of the topographical survey until the soil survey is equally advanced. It may not be out of place here to include an extract from the report of Mr. Milton Whitney, Chief of the Bureau of Soils, referring to the first

work completed, and in which he discusses the practical value of work in progress:

"In the summer of 1900 a soil survey was made from Raleigh to New Bern, N. C., and an area of about one hundred miles in length, averaging about nine miles in width, comprising a total of about nine hundred square miles, was surveyed. Sixteen distinct soil types were recognized, and their agricultural value determined. This great variety was due, in large measure, to the proximity to Neuse River, which has considerably altered the materials within a few miles of its channel.

"The area surveyed extends from the Piedmont plateau to the tide-water region. In the Piedmont plateau the soils are derived from residual decay of metamorphic rocks, and are adapted to cotton and general agricultural purposes. On the coastal-plain portion, which covers a greater part of the area, sandy and silty soils predominate, adapted to cotton, and to the production of a fine quality of bright tobacco. In the lower part of the area, around New Bern, the trucking area has been largely developed in the light sandy soils of that area. The relation of these sixteen types of soils to crops was everywhere pronounced, and in the report the special adaptations were pointed out, and the relative value of each soil for the different classes of crops was shown. There are considerable areas of muck soils, which should be used for the special crops adapted to such soil conditions. There are also large areas of pocosin and savanna soils, which will require extensive improvement in the way of drainage before they can be made at all productive or safe for crops. There is also a considerable area of Garner stony loam, which consists from six to fifteen inches of sandy loam, containing from forty to sixty per cent of rock fragments and gravel, underlaid by a stiff red brick clay. The overlying soil material is firmly compacted, and has the effect of macadam, rendering cultivation exceedingly difficult, and making the soil adapted only to forest growth. The Selma silt loam is the most valuable soil for bright tobacco, especially in its sandy phases on the ridges that traverse the area. In its siltier phases it is one of the finest cotton soils of the locality. Altogether, the soil maps are full of detail, as the types very often are in small area, but as their agricultural values are very marked the possibilities are shown of improvement through the adaptation of crops particularly suited to each type of soil."

When the work is completed it is expected to show on the maps all the variations of soil in the State, and it is believed that, taken in connection with the work now being done on the test farms, already in operation, and on others which it is hoped to establish, very valuable results will be accomplished.

I trust I may be pardoned in saying, in conclusion, that the work of the Department of Agriculture is constantly developing. Much is expected; something has been done; much remains to do. The State is a vast field; its needs are manifold; effort is put forth, here a little, there a little; results are not rapidly evolved; seeds are sown; the fruitage is gathered after. But its record has been one of work.

It gives me pleasure to bear testimony to the industry and zeal, the fidelity and ability of the officials in charge of the various divisions of the Depart-

ment. The State is fortunate in having their services. Every one of them is eminently qualified for the work in his charge. I may say also of the assistants that they are faithful and efficient. What measures of success the Department has had is due to all these. At the close of the next biennial period I confidently expect to be able to report a still increasing amount of work, and to show results that are now only in germ.

I present herewith, and as a part of this report, the reports of the Chemist, the Veterinarian, the Entomologist, the Biologist and Bacteriologist, and the Curator of the Museum.

Very respectfully,

S. L. PATTERSON,
Commissioner.

REPORT OF THE STATE CHEMIST.

RALEIGH, December 1, 1902.

MR. S. L. PATTERSON, *Commissioner of Agriculture.*

DEAR SIR:—I beg to submit a report of the work of the Chemical Division of the Department during the past two years (December 1, 1900—December 1, 1902), together with some suggestions regarding future work.

The report will be made mainly under the following heads:

1. *Analytical Work—*
   - Fertilizer Analyses.
   - Special Fertilizers for Different Crops.
   - Patent Process for Compost.
   - Analyses of Waters.
   - Analyses of Cotton-seed Meal.
   - Soil Analyses.
   - Other Analytical Work.
2. *Pure Food—*
   - Products Most Adulterated.
   - Concentrated Stock Feeds.
   - Law Regarding Concentrated Feeding Stuffs.
   - Standards and Rules.
3. *Soil Survey—*
   - Soil Maps.
4. *Test Farms—*
   - Cotton and Corn.
   - Peanuts.
   - Tobacco.
   - Experiments with Cowpeas.
   - Experiments with Grains.
   - Grasses and Legumes for Pasture and for Hay.
   - Beef Cattle.
   - Other Operations.
   - Statesville Test Farm.
   - Growth of Experimental Work.
5. *Black Rot Experiments.*
6. *Farmers' Institute Work.*

1. ANALYTICAL WORK.

The amount and kind of analytical work performed in the laboratory during the past two years are shown in the following summary of analyses made in that time:

Fertilizers for Farmers	152
Fertilizers for Commissioner of Agriculture	1,232

Health Waters	225
Mineral Waters	156
Cotton-seed Meal	92
Cotton-seed Hull Bran	1
Cotton Seed	3
Cotton-seed Kernels	1
Home-made Fertilizers	4
Marl	10
Muck	1
Stable Manure	3
Tobacco Stems	4
Ashes	4
Peanut Ashes	1
Rice Chaff Ashes	1
Crematory Ashes	1
Lime	3
Tannery Lime	1
Limestone	1
Iron Ores	9
Copper Ores	4
Manganese Ores	2
Cobalt Ore	1
Assays for Gold and Silver	6
Rock	2
Supposed Phosphate	7
Ground Oyster Shells	1
Ground Shell Rock	3
Boiler Scale	3
Boiler Sediment	1
Valve Incrustation	1
Alcohol	4
Minerals, Ores and Rocks Identified and Values Reported	591
Bone Shaving	1
Button Bone Refuse	1
Graphite	1
Oil	1
Coal	1
Earth	1
Mulberries	1
Wild Carrot	1
Chufa Tops	1
Paint	1
River Mud	1
Bran, Shorts, Ship Stuff and Chops	61
Baking Powders and Baking Powder Chemicals	99
Butter	28
Butterine	2
Cheese	30

Coffee	55
Egg Preservative	1
Flours	70
Honeys, Syrups and Molasses	42
Lard and Lard Compounds	52
Malt, Ales, Ciders, Beers, Bitters, Pop and Coca Cola	52
Meal	17
Mustards, Catsups, Sauces and Salad Dressings	44
Peppers, Spices and other Condiments	52
Preserving Powders (Antiseptics)	2
Poultry Foods	8
Jams, Jellies, Apple Butter and Preserves	104
Sugars	19
Tea	25
Stock and Condition Powders	21
Vinegars	49
Rice Meal	2
Rice Flakes	1
Dried Brewers' Grain	3
Molasses Feed	1
Canned Blackberries	2
Corn	57
Apricots	1
Cherries	2
Peaches	5
Pears	3
Pineapple	2
Soil Analyses	185
Total	3,639

Fertilizer Analyses.—This class of work has occupied more of the time of the chemists than all others combined, the chemical division being organized on the basis for performing, with reasonable promptness, the fertilizer analyses. Surplus time out of season is employed in doing the miscellaneous and food work, though attention is given, as far as possible, to the latter classes during all times of the year. All of the fertilizer analyses, except those made for farmers, have been published in the *Bulletin* during the spring months of the two years, and in time for our farmers to know mostly before using the character of the fertilizers they were purchasing or had purchased for use on their crops. Not as many samples have been examined as in the previous two years, but the work has been done in more detail, the forms of ammonia and phosphoric acid having been determined, with the belief that it is better to analyze a fewer number of samples in such a way that the materials entering into the several brands of fertilizers may be more definitely shown, rather than analyze larger number of samples in a less detailed manner. The water soluble, reverted, and insoluble phosphoric acid have all been determined. Water soluble is generally considered somewhat more valuable than the less soluble reverted, as it becomes better distributed in the soil in

consequence of its solubility in water. Of still more importance is the form of the nitrogen or ammonia in fertilizers. Water soluble ammonia, consisting mostly of nitrate of soda and sulphate of ammonia, was determined separately from the water-insoluble or organic ammonia, which comes from cotton-seed meal, dried blood, fish scrap, the tankages, and other animal and vegetable substances. Water- soluble ammonia is quick acting and is easily washed out of the soil, while organic materials must first decompose before their nitrogen can serve as food for plants. They act more slowly, but through a longer period of time. With short season, quick-growing crops, quickness of action is an important consideration, but with crops occupying the land during the greater portion, or all, of the growing season, it is better to have a fertilizer that will become available more slowly so as to feed the plant till maturity. The form or forms of ammonia should be suited, as far as possible, to the season and to the crop. Considerations like these led us to make more detailed analyses, and we feel that the work is justified on this ground.

Tobacco growers are becoming yearly more desirous of knowing the form of potash—whether from kainit, muriate or sulphate—which enters into their tobacco fertilizers, and we have made a considerable number of analyses each year for this purpose. I now consider it desirable to extend the analyses of all special brands for tobacco so as to furnish this information, and will inaugurate this with the coming season.

Special Fertilizers for Different Crops.—It will be observed that only three constituents are determined in fertilizers—ammonia, phosphoric acid and potash. They make up but a comparatively small portion of the total weight of fertilizers, but it is solely for their sake that fertilizers are purchased and used. Their amounts determine the money value of the different mixtures and their amounts and proportions, the crop-producing power or value. Some crops need one or two of these constituents more than the other one, or the other two, to enable them to make the largest and most profitable response for the fertilizer applied. It is to meet the varying plant food requirements of different crops that *special fertilizers* are made or should be made. It is interesting in connection with the more detailed analyses of fertilizers just referred to, to consider briefly the amounts of ammonia, phosphoric acid and potash, and the wide variations in these, in the various brands of fertilizers sold on our markets as "specials" for different crops. In 1901 there were registered in the Department 108 special tobacco fertilizers. The highest amount of phosphoric acid in any of these was 9.25 per cent, and the lowest 5 per cent; the largest amount of ammonia was 10 per cent and the lowest 2 per cent; and the maximum quantity of potash 5 and the minimum 1 per cent. In like manner there were 36 "special" brands for cotton, the three valuable constituents varying as follows: Phosphoric acid, 8 to 9 per cent; ammonia, 2 to 3 per cent; and potash, 1 to 4 per cent. Of potato "specials" there were 20 brands registered, the constituents varying as follows: Phosphoric acid, 2 to 8 per cent; ammonia, 2 to 7 per cent; potash, 3 to 8 per cent. There are also specials for wheat and other grain, corn, cabbage, strawberries, and other crops with like wide variations in the quantities of these fertilizer constituents. These facts are presented in detail in the May (1901) *Bulletin*, and should at least cause the users of fertilizers to think as to whether or not

they are, in these extremely different mixtures (specials), using the fertilizers that will give them the best returns in crops produced for the money expended. Either some growers are losing in the quality and quantity of their crops or else others are throwing away money in the purchase of higher grade fertilizers, supposed to be better suited to the needs of their crops. It is difficult, if not impossible, to say what is the best fertilizer for a certain crop under the different conditions of soil, cultivation and rotation to which land is subject, but we are gradually coming into the possession of results which enable us to deal with the question in a fairly intelligent way and with the progress of our experimental work in the Experiment Station and the Department, combined with the experiences of careful and observant farmers, whose co-operative aid we are seeking and using, we should be in a position from year to year to speak with better authority on the subject than in the previous years. I suggest, therefore, the desirability of this Department's having authority, by legislative enactment, if necessary, to regulate the registration and sale of special fertilizers for different crops to the extent of preventing the registration as "specials" for certain crops such brands as are clearly not well suited to those crops. Special fertilizers for crops are to be encouraged, but they should represent something, and not be merely names to help sell the goods.

Lipps' Patent Process for Compost Fertilizers.—For several years a formula under this name, first as a "Secret Process," and then as a "Patent Process," has been sold to the farmers of the State, largely in the western and middle western counties. Claims of great virtue were made for it, and $3.00 was charged for the right to use it. Attention was first called to it in an article in the January (1901) *Bulletin.* Letters from farmers regarding it became so numerous during the past winter that it was considered desirable to publish the process in full, together with a discussion of it. This was done in the February (1902) *Bulletin.* Since then not so much has been heard of it, though the *Bulletin* containing the article has been largely called for within and without the State, the outside demand being especially from South Carolina and Georgia, which indicates that operations are being transferred from this to other States. I may add that the process possesses very little merit, containing nothing new, is misleading in many particulars, and there is no reason for farmers purchasing it. The principles of plant growth and plant food requirements are now too well understood for there to be mysterious and secret prescriptions for fertilizers and composts, and when such are offered it may be concluded safely and at once that they are schemes to get money without corresponding compensation. It is encouraging to note the quickness and readiness with which our farmers come to this Department for advice and assistance in matters of this kind.

Analyses of Mineral and Potable Waters.—Three hundred and eighty-one waters—225 potable or drinking and 156 mineral—have been analyzed during the past two years. No doubt considerable good has been done by this work in the prevention of sickness from the use of bad potable waters. It would be well if the chemical and bacteriological analyses of potable waters were made by the same person, instead of by different ones, as at present, so that the two results might be combined in forming an opinion of the character of

the water. It seems to me desirable for the State Board of Health to have this class of work. There can be no question of its great value in preventing sickness, and should be done even more extensively than at present, if possible.

Advantages have come, and will likely continue to show themselves in the future, in consequence of a better knowledge of our mineral waters, as shown by the examinations of this class. We are now putting together the results of the analyses of all mineral waters made during the past few years, with the view of publishing them some time in the future.

More of this kind of work is done than there is really any need for, it having become the custom for waters to be sent from all sorts of sources.

Analyses of Cotton-seed Meal.—The past two seasons have witnessed advances in the selling price of cotton-seed meal. Along with this, especially in the fall of 1901 and the spring of 1902, the amount of adulteration was greater than ever before. The mere difference in the looks of the meal from what it had been in past years attracted wide attention among farmers and feeders, and as a consequence, we have been called upon to make a larger number of analyses of meal than usual—92. This has been done as promptly as our other work would permit, so as to give the users the benefit of the results before the product was gone. We have a large amount of evidence of appreciation of this assistance from the Department, in the shape of letters which have come to us, stating, in some cases, that the analysis showed the meal was not up to guarantee, and that the manufacturers had paid the difference.

The correspondence which has come to me, together with what I have learned in conversations, show that the action of the Board in placing cotton-seed meal under inspection and requiring a guarantee has met with approval.

As stated above, the grade of meal during the past season was not up to that of former years. This was due, in part, to the character of seed grown in 1901. Notwithstanding this, some mills made, as will be shown by results to be published later, a good quality of meal from 1901 seed.

Soil Analyses.—In connection with the soil survey, a large number of samples of type soils, from virgin and cultivated areas, have been collected and are being analyzed as time permits. Some of these results are proving very interesting in unexpected ways. This work is being prosecuted on a systematic basis with the idea of thoroughness and permanency in view, and when completed I feel that we shall have results of great value to the agriculture of the State.

Other Analytical Work.—In addition to the analytical work specifically referred to above, there are a considerable number of other samples of interest and importance, and which are enumerated in the summary. Nearly 600 samples of ores, mineral and rocks have been identified and values reported, when any were attached to them. Most of these specimens have no value, but occasionally important finds are made in this way. The large and valuable deposit of iron ore at Wilson's Mills has been developed on basis of the results of the work of this Department. This property is now leased to the Empire Iron and Steel Company, of Greensboro, a branch road is almost completed to it, and this Johnston County ore will be the main supply for the furnace. There are other results of interest, which will be published in the *Bulletin* when there is a sufficient accumulation to justify it.

2. PURE FOOD WORK.

The General Assembly passed what is generally known as the "Pure Food Law" in February, 1899. This law went into effect on August 1st of that year. In our first report on the inspection and analyses of food products under this law, published in the December (1900) *Bulletin*, the results of the examination of 507 samples of human and animal foods obtained at 37 points in the State, were given. Of these materials 56 per cent were found to be in some way adulterated. The second report (for 1901) on this work, presented in detail in the September (1902) *Bulletin*, contains the results of the chemical and microscopic examination of 308 products. Of this number 110, or 35.7 per cent, were found to be in some way sophisticated. The products inspected and analyzed in 1900 were largely of different kinds from those included in the report of 1901, which may account for the decrease in the amount of adulteration. Our third report (for 1902), now in course of preparation, and which it is proposed to publish in the coming January *Bulletin*, will contain the results of the analyses of some 600 food products. In this work the classes of materials examined the first year are being again worked, and while it is too early to give definite results, the indications are that the amount of adulteration in the same classes of foods is notably less, showing that the publication of the results in the *Bulletin* and calling attention in the newspapers to adulterated products, are having wholesome moral effect.

Products Most Adulterated.—The materials found up to this time to be the subjects of the largest amount of deception are jelly, jam, fruit butter, preserves, molasses, honey and syrups, nearly all of these products being in some way mixed with other materials, or were wholly imitation products. Two-thirds of the canned vegetables examined in 1900 were found to be artificially preserved with chemical antiseptics, there being analyzed 227 samples, of which number 151 contained one or more of the following preservatives: Formaldehyde, salicylic acid, benzoic acid, or sulphurous acid. Over three-fourths of the beers and other alcoholic drinks examined (35 samples) in like manner contained preservatives not natural to them; and seventy-two per cent of the non-alcoholic summer drinks (33 samples) had been subjected to the same treatment. Most of the bottled "sodas" were sweetened water, charged with carbonic acid, and partly or entirely artificially colored, flavored and preserved.

Fifty-nine per cent of the vinegars examined in 1900 were either adulterated or were not sold under their true names, as against 30.7 in 1901, showing an improvement in this line.

The Concentrated Stock Feeds, as wheat bran, ship stuff, chop feeds and cotton-seed meal, though the latter has been generally of satisfactory quality up to the past year, are badly in need of inspection and regulation. Nearly all of these products, except cotton-seed meal, came from without the State, and our analyses show many of them to be of low grade and to have had ground with them such filling and objectionable substances as oat hulls, chaff, mill sweepings and cleanings and weed seeds. There is a double loss to the farmer or feeder in having such low-grade feeds imposed upon him, in that he pays more than they are worth to begin with, and then has the concen-

trated animal product—milk, butter of beef—into which he is converting them reduced.. A considerable amount of work of this class has been done for our farmers during the past two years, and especially during the past season have we encouraged them to send us samples of suspected feeds for examination, with full data concerning them, as we felt that the unusually high prices which were ruling in this class of products lent special inducements to adulteration. Some materials sent in and selling for from $20.00 to $30.00 per ton were found to be made up of as much as one-half hulls and chaff of the grains. On basis of our findings some of the purchasers have been reimbursed. We have done this work as promptly as possible, so as to give the results before the materials were used, though this frequently could not be done on account of the precedence of the more compulsory fertilizer work.

Law Regarding Concentrated Feed Stuffs.—I feel that the time has come when a specific law regulating the manufacture and sale of concentrated feeding stuffs and providing for their inspection and analysis should be passed. Nearly all of the States to the north of us and the central States have such laws, in addition to their pure-food laws. Sufficient revenue could be raised by such a law to cover the cost of inspection and analysis, and thus enable the putting of it on a self-supporting basis and providing for the prompt performance of the work. At present the food work is limited almost entirely to the summer and fall, when the chemists are not occupied with the fertilizer analyses.

The laws on this subject in operation in the States referred to are very similar, and as a result of the study of them and correspondence with the officials having in charge their execution, I submit the draft of a bill which seems suited to our conditions, and which I consider should receive the serious consideration of our coming Legislature. I might add that this matter was fully considered and received the unanimous endorsement of the Board at the recent meeting.

Standards and Rules.—The food law gives the Board of Agriculture power to prescribe standards of strength and purity for food products and to adopt rules for branding and labeling and a form of guarantee for merchants to take from manufacturers. The action of the Board covering these matters are published in the September (1902) *Bulletin* and need not be repeated here. Standards for other foods, not thus far covered, will be submitted for the approval of the Board as fast as it is felt that the matter is in satisfactory shape.

Summary Statement.—Up to this time chemical and microscopic examinations have been made in the laboratory of the Department of nearly 1,500 samples of human and animal foods. Over 800 of these have been published in the two reports already made and the others will follow in the forthcoming one. Great interest is being manifested in this field of the Department's work, as is evinced by the frequent letters which are received on the subject and requests made by town officials, health officers and individuals for the examination of various materials. Our reports have been in great demand from within and without the State, the requests from a distance being largely from manufacturers, who are seeking information regarding our law, standards and rulings, and who generally express a desire to make their products comply with all requirements. Through the information thus distributed in

our reports and through the newspapers regarding the brands of adulterated foods, a great deal of good has already been done in an educational way—the very best way—and a foundation laid for a gradual bettering of the quality of food products on our markets.

The amount of adulteration found in our work shows the importance of the law; that it was not passed too soon, and that there is need of a gradual extension of the work. The following summary statements are taken from our reports for 1900-1901:

SUMMARY OF RESULTS OF THE EXAMINATION OF FOOD PRODUCTS, 1900.

	Total Number Samples.	Not Found Adulterated.	Found Adulterated.	Per Cent. Adulterated.
Beers and other alcoholic drinks	35	8	27	77.14
Breakfast foods	24	23	1	4.17
Butter	11	11		
Canned asparagus	9	2	7	77.77
Boston baked beans	1		1	100.00
Celery	2		2	100.00
Corn	70	28	42	60.00
Corn and tomatoes	4		4	100.00
Garden peas	37	7	30	81.00
Lima beans	8	3	5	62.50
Okra	2	1	1	50.00
Okra and tomatoes	8		8	100.00
Pumpkins	8	4	4	50.00
Snap beans	9	2	7	77.77
Succotash	14	13	1	7.14
Tomatoes	55	20	35	63.63
Catsups	36	1	35	97.22
Flour	37	37		
Lard	11	10	1	9.00
Non-alcoholic summer drinks	33	9	24	72.72
Oil	11	9	2	18.18
Sauces	7	1	6	86.00
Vinegar	22	9	13	59.00
Total human foods	454	187	256	56.04
Commercial stock feeds	53			
Total	507			

SUMMARY OF RESULTS OF THE EXAMINATION OF FOOD PRODUCTS, 1901.

	Total Number Samples.	Not Found Adulterated.	Found Adulterated.	Per Cent Adulterated.
Baking powders	85	69	16	18.8
Coffee	55	35	20	36.3
Condiments	44	35	9	20.4
Jams, fruit butters and preserves	25		25	100.0
Jellies	10		10	100.0
Molasses, syrups and honey	32	6	26	81.2
Sugar	19	19		
Tea	25	25		
Vinegar	13	9	4	30.7
Total	308	198	110	35.7

3. Soil Survey.

This Department, in co-operation with the Bureau of Soils of the United States Department of Agriculture, commenced a systematic investigation of the soils of the State in May, 1900. In this work the soils of the areas are gone over and carefully examined by an experienced judge of soils, and wherever in any part of the State the same type of soil is found its amount and boundaries are indicated by the same color in accurately prepared maps. The examination extends to a depth usually of three feet. A large number of samples from virgin and cultivated areas have been collected and have been and are being analyzed physically by the Bureau of Soils of the United States Department of Agriculture, to ascertain the kinds and amounts of the various materials, as sand, clay, silt, etc., of which they are composed; and chemically by this Department to determine the total and reasonably readily available plant food constituents in them. No pains are being spared by us to make these analyses accurate and thorough, and when completed and considered in connection with the results of our field experiments on the test farms and the Experiment Station, will greatly add to our knowledge of the natural and reserve fertility of our different kinds of soil and their artificial plant food requirements.

The influence of the kind of soil on the production of different crops to best advantage is being recognized as of more and more importance as experimental work in different lines advances. All types of soil are better adapted to some crops than to others, and some plants and fruits will only grow to the greatest degree of perfection on the type soil that best furnishes the conditions for their development. This adaptability of plants to soils is well illustrated in the phenomenal success of the Rocky Ford cantaloupe, the ordinary netted gem of other sections, in the Arkansas Valley; the growth of fine Cuban and Sumatran tobaccos on certain soils in the Connecticut Valley and else-

where in the United States; the removal of the bright tobacco industry of this State from its former home in the central and piedmont sections of the State to the same, but more abundant type of soil in the Eastern part of the State, and the production of that finest of all apples—the Albemarle pippin—only on its characteristic type of soil—moist, loose, black, feldspathic soil of the mountains of Virginia. (It should find an equally congenial home on the same type of soil in our mountains.) It seems, then, highly important that each State should seek out as far as it can the kinds of soil wiich are best adapted to its different crops. Because of these and other applications which might be given the soil survey work, I consider it an important line of the Department's endeavor.

Soil Maps have been made as follows:

(1) In 1900, of an eight-mile strip on the two sides of the railroads extending from Raleigh to New Bern, and containing about 900 square miles, in the counties of Wake, Johnston, Wayne, Greene, Craven, Jones and Lenoir.

(2) In 1901, of an 800-square mile area, in the counties of Iredell, Rowan, Davie, Lincoln and Catawba; of all of Alamance County (365 square miles), and of about 800 square miles in the counties of Craven, Jones, Pitt and Greene.

(3) In 1902, maps were made of a 1,000-square mile area, in the counties of Catawba, Alexander, Lincoln, Caldwell and Burke; a 500-square mile area in Yancey, Mitchell, Buncombe and McDowell Counties, and 500 square miles in Pitt, Martin and Beaufort.

In all, approximately 4,865 square miles of our soils have been surveyed and mapped, which is equal to about ten good-size counties.

It might be added that these maps are accurate ones of the sections they represent and have located on them the rail and dirt roads, streams, towns, villages, churches, school-houses, farm-houses, etc. They will prove useful for general purposes; in connection with schools, serving as the means of directing the attention of students to the natural and crop growths, etc., on different soils, and will be valuable for furnishing prospective immigrants important information as to the location of types of soils which they may be seeking.

4. TEST FARMS.

The season just closing concludes three years' operations on the Department's two test farms in Edgecombe County, and at Red Springs, in Robeson County. Detailed reports of the first two years' experiments have been published in the *Bulletin* for November, 1900, and January, 1902. At the beginning about twenty acres of leased land were used in the experiments, but after two years' work it was deemed advisable for the Department to own the land and have larger areas at its disposal for its operations, thereby laying a broader and firmer foundation for the work and making it possible to put the results of the experiments into operation on a considerable scale—one that would yield some revenue, at least, to assist in bearing the expense of the tests—and showing that the work is not merely of plat and garden order, but that it is susceptible of the broadest application.

Accordingly, a year ago a farm of 201 acres was purchased in Edgecombe County at a very reasonable price. It is located near the station of Kings-

boro, about midway between Rocky Mount and Tarboro, and it is on this farm that our work in that section has been conducted this year.

Our main tests are with crops most largely grown in the sections, and are briefly as follows:

Cotton and Corn.—Between 60 and 70 different tests are being made with each cotton and corn, on tenth-acre plats. Twenty-two (22) of these are devoted to different combinations and amounts of acid phosphate, cotton-seed meal and kainit, with a view to determining the best balanced fertilizer and the best paying amount for these crops on these particular lands. Three plats are given to testing the effect of dividing the fertilizer, and applying in one case half of all constituents at planting and half later, and in two cases to applying all the acid phosphate and kainit and one-half the meal before planting, putting on the other half of the nitrogen later, as nitrate of soda on one plat and as cotton-seed meal on the other. Two plats are devoted to different methods of cultivation, ten to rotations to see if vetch, peas, burr clover, velvet beans, soja beans and peanuts—winter and summer-growing nitrogen gatherers—will not collect from the air all the nitrogen that is needed by these crops; two plats to test the effect of lime; three to compare cotton-seed meal, cotton seed and stable manure as sources of nitrogen; two to test acid phosphate and finely ground phosphate rock as sources of phosphoric acid; two to different depths of applying the fertilizer; four to show the effect of velvet beans, soja beans, cowpeas and peanuts grown last year on this year's crop, giving them only acid phosphate and kainit both years as fertilizer, and ten to fifteen to testing varieties of cotton and corn, together with different distances of plants in the rows and different widths of rows, and methods of selecting seed for improvement of yield.

Peanuts.—Thirty-five one-twentieth-acre plats on the Edgecombe farm are given to tests of different fertilizer applications, culture methods and varieties of peanuts, along the same lines as those referred to for cotton, with the idea of obtaining information regarding the best methods of growing and handling this important Eastern crop.

Tobacco.—An experiment was conducted on the Edgecombe farm the past season with Cuban tobacco to determine its adaptability to that soil and climate. The results so far are not such as to justify any definite conclusion, but will require repetition under changed plans before we can speak one way or the other regarding it. This test will be repeated next season.

A fertilizer test was also made to determine the effect of different quantities of potash in fertilizers, otherwise alike on the quality and yield of bright tobacco. The results will appear in our next report.

Experiment with Cowpeas.—An extensive series of tests of cowpeas were made on the Red Springs farm this year and were directed toward obtaining information on the following points: Time of planting, which extended from May 1st to August 1st; different width rows, from 8 inches (put in with grain drill) to 3½ feet, with and without cultivation for rows over 2 feet; quantity of seed per acre, when planted in rows, and varying from one peck to 1½ bushels; quantity of seed when planted broadcast, and varying from one-half bushel to 1½ bushel; fertilizer test, and test of all varieties which could be obtained and numbering sixteen. In all there were 84 different experiments,

and each of these was divided into half, one portion being cut for hay and the other half gathered for the yield of peas. These results will be published in the *Bulletin.*

Experiments with Grains.—Increased interest is being shown yearly in the growing of grain in the Eastern part of the State, some of our farmers having succeeded specially well with wheat after cotton. Oats are grown to a considerable extent, but mostly as a spring crop. Our experiments, as well as those conducted elsewhere in similar climate, show that the early fall-sown oat, while lost occasionally from freezing, is by far the heaviest yielder and the most profitable way to grow this crop. Two years ago we conducted some tests on the Edgecombe farm and are repeating them this year on much larger scale, some fifty different varieties of wheat, oats, rye and barley being included in the trials, to determine the ones best adapted to that section. With the best yielding kinds we shall attempt to still further improve the yields by careful selection of seed. In this way we hope to find and develop two or three varieties of these grains that are well suited to the Eastern section of the State. Included in these experiments are tests of different times of sowing wheat in the fall, oats in the fall and spring, methods of preparation of land for oats and wheat and methods of sowing—broadcast and in different width drills. In all, there are 80 different tests with grains, and we feel that important results will come from them, especially after they have been repeated a sufficient number of times to give reliability to the results.

Grasses and Legumes for Pasture and for Hay.—Over one hundred small plats have been put out in grasses and legumes and combinations of these to test the adaptability and value of native and new grasses and legumes for pasture and hay production, and for use as winter-cover crops, and in rotations with the usual crops of the sections. On such of these as give promise of success our tests will be extended to develop the best methods of growing and handling to obtain the surest and most profitable crops. Up to this time quite a number have done well, but it is never safe to draw conclusions too soon. Of the grasses, tall meadow oat, Italian rye and English rye, early grazing and hay grasses, have done especially well. Of the legumes, burr and alsike clover indicate well, and hairy vetch, where the soil was inoculated, has made a highly satisfactory growth. The experiments with the legumes have also included methods of inoculating the soils, so as to get the bacteria so necessary to the growth of each kind of this class of plants onto their roots. We are all the more encouraged to push this phase of our experimental work, because of the large number of inquries which come to the Department concerning them. With a few further years of experience I feel that we shall be in possession of much valuable information regarding the kinds that are suited to our different soils and sections and the methods of growing them, as these tests are now being made on the Experiment Station farm at Raleigh on a sandy loam underlaid by stiff red clay (designated in our soil survey classification a cecil sandy loam); on a fine grain type of sandy soil in Edgecombe County, and on a smaller scale on a coarse-grained sandy soil in Robeson County. These experiments will also be put out on the new test farm in Iredell County, which is on a representative of the red clay lands of the Piedmont section of the State.

Beef Cattle.—Fourteen head of thoroughbred and high-grade beef cattle (3 thoroughbreds and 11 grades) of the Aberdeen-Angus breed have been added to the Edgemont farm with the view of making beef production, in connection with the grass and forage plant work, one of the lines of experimental work, as well as a feature of the general farm operations. These animals were obtained in Missouri last winter, through the courtesy and assistance of the Director of the Missouri Experiment Station, who made the selections and purchases. They were a part of a car load of 39 head purchased for the Experiment Station, the Department of Agriculture, and a number of farmers in different parts of the State. Those going to "ticky" pastures were inoculated by Dr. Butler, the Veterinarian of the Department, who furnished instructions regarding the care of the animals till they became thoroughly immune to Texas or tick fever. So much interest was shown in this lot of animals that it was found desirable to bring in another lot of nineteen head during the fall. These were obtained in Ohio, and nearly all of them go to farmers who placed orders in advance. We feel that this is one of the best ways of advancing the stock interests of the State—by getting into the hands of our farmers a better class of cattle. These animals are delivered at actual cost and without any charge for services. The animals thus far have gone, or will go, to the following counties:

Henderson	1
Edgecombe	20
Wake	20
Forsyth	2
Iredell	2
Richmond	3
Beaufort	2
Lenoir	1
Chowan	1
South Carolina	1

Other Operations.—The portions of the farms not used for experiments have been devoted to the production of feed for the teams and stock, and other crops generally grown in the section—cotton, corn, peanuts, tobacco and small grain, these crops being put in what is considered a desirable rotation for profitable production and the improvement of the land, the idea being to base the general farm work on the outcome of the experiments, so as to give the test farms a thoroughly practical turn and application.

Statesville Test Farm.—The test farms and their work are growing in interest and importance. To make this phase of the Department's endeavors of the greatest practical value to the different sections of the State, it was decided advisable to locate a third farm on a good type of red clay land in the Piedmont section of the State. The decided interest and friendly rivalry among the citizens of a number of the Piedmont counties for the selection of a site in their respective counties and localities were specially gratifying to the Department, as showing appreciation of the Department's efforts in behalf of the agriculture of the State. Because of desirability of type of soil, location near the town, on a good and frequented dirt road, a railroad and near a

second railroad and the depot, and most hearty interest and financial aid from the citizens in and around Statesville, in Iredell County, the farm was located just to the west of that town. Work will be started on that farm this spring, devoting attention to the methods of preparation, cultivation, fertilization and rotations for the crops now generally grown in Piedmont North Carolina, and new ones which seem most likely to succeed well there and which would add to the interest of the agriculture of that section.

The soil survey, as far as it has proceeded, shows that our Piedmont area is made up of more than fifty per cent of red clay land, the next largest type being the gray land or sandy loam underlaid by red clay. On this latter type the Experiment Station at Raleigh is located. The location of the Statesville farm puts us in position to conduct our experimental work on the largest and most important type soils of the State this side of the mountains.

We feel that it is important for the results which are to be used by the Department and the Experiment Station in aiding our farmers to better their agricultural methods and practices and in teaching the coming generation, to be obtained not only in actual experiments, but that these tests should be secured, as far as possible, on the kind of soil and under the conditions which are to surround their application in farming operations.

The Growth of Experimental Work.—The development of the experimental idea in agriculture has been almost phenomenal. It had its beginning in Germany when the first experiment station was established fifty years ago. The fifty years which have elapsed since this work was begun "in so meager a way have witnessed the establishment of a system of stations as State or Government institutions in practically every civilized country. These have steadily grown in strength and in importance, until now they may be ranked as among the permanent institutions of civilized nations, as much as the schools and universities. They are fostered alike under the republic and under the unlimited monarchy, and are recognized by all enlightened people as constituting an essential element in national welfare. Rarely, indeed, has one been abandoned or its maintenance funds permanently diminished."*

In this country experimental work in agriculture has obtained its present growth in twenty-seven years, and as a main enterprise in fourteen years. This State was the second in the Union to establish an Experiment Station, being conducted during the first eleven years of its existence in connection with and by the support of this Department. Since 1887 it has been financed by the Hatch appropriation of the National Government. Every State and Territory in the Union now has at least one Experiment Station, and they have become permanent institutions of great power for the advancement of the agriculture of the several States. So much so is this, that the National Government gives annually $720,000.00 for their support, and the States, in one way or another, $511,881.15 (last year), either to supplement the station fund proper or to conduct independent experiments by other institutions. Connecticut has two Experiment Stations, the State giving $14,300 to their support; New York two, with State aid of $99,250; New Jersey two, with $19,000 from the State; Louisiana three, with $30,000 additional help, to a considerable extent the work of the Department of Agriculture; California one main station, four culture and two forestry stations, in different sections

*Experiment Station Record, Vol. XIV, 2; p. 103.

of the State, receiving $11,545 from the State; Alabama one regular station and two sub-stations, receiving $4,000 from the State; Colorado one sub-station in a section away from the main station; Michigan two, in other sections, with State aid of $6,467; Minnesota three, in separate sections, with $35,956 additional appropriation; Mississippi one additional sub-station, with $6,500 from the State; Missouri one fruit station, apart from the main station, receiving $13,267 from the State; New Mexico three sub-stations; Ohio two sub-stations, away from the main one, all receiving $25,000 additional help; Texas two sub-stations, getting $8,750 additional funds; Washington two sub-stations, away from the main one, with $9,848 State help; Utah one sub-station, with $3,000 State help; Oregon one sub-station, with State aid of $5,000; Wisconsin gives $14,000; Massachusetts, $11,300; Kentucky, $36,000, and Illinois, $46,000 (largely used for work in different parts of the State) to the main stations. Canada has six experimental farms in different parts of the Dominion, all supported by Federal appropriations, and the Virginia Department of Agriculture is following the plan of this Department and is establishing test farms on the different soil areas of the State.

These facts relating to agricultural experimentation are recounted here to show the estimate that is placed on the work, the provisions that are made for its support, and to suggest the urgent need and importance of this Department's dealing in as thorough and comprehensive sort of way as possible with the agricultural questions confronting our farmers, or else allow our farming interests to fall behind those of other States, where more ample provisions are being made and where more strenuous efforts are being put forth for the development of the best possible methods and systems of farm practice.

There never was a time when there were more expenditures of means and effort than at present in the study of agricultural matters. I believe that this Department, in its small way, is beginning and doing important work for the agriculture of the State, and in the right way. Its work is specific; its plans definite. Its problem, as now outlined, is the development of the best methods for producing the plants for the different soils and sections of the State; and it has gone to the specific localities and soils where it proposes to apply the results to propound the questions. This is in accord with the best and most recent plans of experimentation.

5. Black Rot Experiments.

For several years black rot has been growing more and more severe in its attacks on the grape crop, especially on the Niagara variety. In 1901 a number of large growers of Niagara grapes dug up their vineyards because they could not combat the attacks of this fungus, and such discouragement existed generally that the entire Niagara grape industry of the State was threatened with destruction. To assist in this matter this Department and the Experiment Station joined the United States Department of Agriculture in making a thorough study of the disease to see if a remedy that would save this important industry to the State could not be found. The Department and Station paid field expenses and the United States Department of Agriculture furnished an expert in plant diseases to conduct the experiments, which were carried on at Southern Pines and Tryon, in this State. The results of the

season's investigations indicate that a successful treatment has been worked out, at least it proved so last year, and will likely be even more so when modified by the experience of the first year's operations. This information will be put out in a bulletin for the use of grape-growers.

6. FARMERS' INSTITUTES.

I have attended, as you know, nearly all of the Farmers' Institutes held by you during the past two years, and besides being much interested in them, and benefited by the contact with farm methods, operations and conditions in the different parts of the State, I have felt encouraged, especially at certain places, at the growth of interest in the institutes. This, in my opinion, is one of our main contact points and should be made the instrument, as far as possible, for bringing the Department, the Station and other agricultural agencies and their work and the farmers and their work together, with the view of discussing the matters in which they are all interested and with which they are all working.

CORRESPONDENCE.

An additional evidence of the growing usefulness of the Department is the greatly increased number of inquiries on various subjects relating to farm and other matters which come to me. During 1901 I sent out letters and analyses to the number of six thousand, and during 1902 to the number of seven thousand, making a total of 13,000 for the past two years.

CONCLUSION.

In conclusion, I desire to commend most fully and heartily the efforts of the workers associated with me. They have been industrious, earnest and faithful, and to them is due a full share of credit for whatever has been accomplished.

It is especially pleasant to say that I find myself under continued and renewed obligations to you, Mr. Commissioner, and to the Board of Agriculture for the uniform interest and consideration shown me in the conduct of the work entrusted to my charge, for all of which I thank you most heartily and respectfully submit this review of operations for your information and consideration.

Very respectfully,

B. W. KILGORE,
State Chemist.

REPORT OF THE ENTOMOLOGIST.

MR. S. L. PATTERSON, *Commissioner of Agriculture.*

SIR:—The work of this office is to investigate the ravages caused by insects, and to prescribe, as far as practicable, the remedies which may be used in combating the depredators. Not a season passes but that some insect pests cause immense damage to our agricultural interests. In 1901, chinch bugs wrought havoc with grain crops in the middle Piedmont, while wheat was badly injured by Hessian fly further west in the same section. In the east the corn bill-bug did the usual amount of damage, inflicting a heavy loss in many localities. The same year all kinds of fruit pests were abundant, and the apple crop throughout the Eastern part of the State failed, as has been usual for a number of years. That this failure of the apples in the east may be mostly prevented by proper remedies, is fully proven by the following letter from an ex-Confederate soldier in Durham County, who tested the matter of treating his trees under direction from this office. He says:

"* * * Now for the results. I had more matured apples than I have had in one season for the past ten years. * * * All trees sprayed are as green, is nearly as green, now (October 14, 1901) as they were in summer. * * * I sprayed one side of a large fall apple tree. The side sprayed is green to-day, while the other side has no leaves. To be brief, all trees sprayed are full of leaves, while those not sprayed are destitute. * * * I am very well pleased with my experimental spraying, and next year will spray again more thoroughly than I did the past spring.

"Yours truly, R. C. T."

The following is an extract from a letter from a farmer in the Eastern part of the State:

"Last year my tobacco was materially damaged by flea-bugs, my cotton almost complete failure on account of lice, and my other crops damaged more or less by various kinds of insects. Without some means to combat the various pests to which our crops are subject, I feel that the farmer must succomb to complete failure. Would be glad to have advice from the Department as to best means of preventing and destroying these deadly enemies to our crops."

Still another correspondent sent in the following:

"You are doing a good work, and I trust that your efforts may be crowned with success."

These few extracts from our correspondence are here quoted to show that the work is taking a real hold among the farmers, and that they are profiting by the information given out.

In the year 1902, just closed, the strawberry weevil caused immense loss along the Weldon and Wilmington Railroad, the loss at Wallace, Willard and Rocky Point being reported to me at from one-fourth to three-fourths of the

entire crop. Insect pests of all kinds seem to have been unusually destructive.

It is not claimed that all insect pests can be combatted with perfect success, but it is a fact beyond question that the great majority of them can be kept largely subdued if the proper remedies are applied at the proper time. It is a question of educating the farmers to adopt the measures required. Practicable remedies are known for the majority of the pests, and the greatest effort of this office has been to teach the people to properly use these known remedies, rather than to experiment with new ones, especially as such experimentation would consume more of time and money than has been available.

The majority of insect pests of fruit, truck and garden crops are best combatted by poisoned liquid mixtures applied by means of spraying pumps. To show the practicability of this, a number of tests were made the past year in the Eastern, Middle and Western sections of the State, the principal plants treated being apples, potatoes and grapes. As far as results have yet been reported, they seem to have been very satisfactory, only one correspondent (in Johnston County) reporting that on apple trees he could see no benefit, but the same man says it was a success in killing the potato beetles. A number of letters might be quoted showing that the directions sent out from this office were of great aid in combatting these pests.

But the one insect which causes more work and uneasiness than any other is the San Jose scale, a small inconspicuous pest, which attacks fruit trees. On account of the fact that it is largely disseminated by the shipment of infested trees, this pest has been the subject of much legislation, making certain entomological work compulsory in all States where commercial nurseries are located. No nursery in this State can legally ship even a single fruit tree unless it is accompanied by a certificate stating that the nursery has been duly examined for insect pests. Even if there were no such law in this State, the laws of other States would compel these nurseries to be inspected by some authorized person every year, for no tree can be shipped into any of our adjoining States unless it is covered by certificates as before mentioned. Were it not for the laws and the strong efforts being put forth by entomologists and nurserymen to limit the spread of this pest, it would, without doubt, be far more generally distributed than it now is. The protection is not, and never can be, absolute, but that it does great good is evident to anyone who will inquire carefully into the situation.

Every North Carolina nursery is inspected each year in order to discover the San Jose scale, and other pests, if they exist on the salable stock, and to cause remedial work before granting certificate, in case they are found. The inspection of the forty-five nurseries of the State occupies about three months, during the very hottest season of the year, and it is as hard manual labor as any day workman has to perform.

The Legislature of 1897 passed an Act (Chapter 264, Laws of 1897) looking to the suppression of the San Jose scale and other pests. At that time this scale was not known to be widely distributed in the State. The appropriation made was five hundred dollars per annum, and this was thought to be sufficient to carry out the provisions of the law, but the inspection of orchards in

various parts of the State, which was made possible by that law, has already located the scale in no less than twenty-two counties of the State, as follows: Alamance, Carteret, Catawba, Cleveland, Cumberland, Durham, Franklin, Gaston, Guilford, Halifax, Haywood, Jackson, Lenoir, Mitchell, Moore, New Hanover, Pitt, Sampson, Scotland, Surry, Wake and Wilson. No section of the State is exempt, and in all of these counties the scale is, without doubt, slowly spreading from place to place. In places where we have been able to visit the orchards, and point out the extent of the infestation, and recommend remedies, some of the growers, at least, have learned that it can be controlled by persistent, careful and thorough work. Unfortunately, some growers seem to have the idea that they can absolutely exterminate the pest, whereas, in fact, such a thing is out of the question. If by treating a tree once or twice each year it may be kept in sufficiently good health to produce a satisfactory crop, nothing more need be expected, for this is all that we can ever do with any pest, though in this instance the cost is considerably greater. Moore County has been the greatest sufferer from this pest, and in the large peach orchards around Southern Pines, the owners have voluntarily dug up and burned many thousands of trees in their efforts to control the spread of the pest. On the other hand, many thousands have been condemned by the Entomologist, as provided for in the law, and, the owners being unwilling to treat, have been compelled to remove them. It is but truth to say that the expedient of compelling the removal of trees is left as the very last resort, only being employed in the most extreme and aggravated cases, and where neighboring orchardists demand the full enforcement of the law, with what seems to us to be overwhelmingly sufficient reason. Every possible opportunity is afforded owners to treat their trees. We have believed that it was the intention of the Legislature to leave liberal discretionary powers in this matter with the Commission for Controlling Crop Pests.

Inasmuch as all nurseries in the State must secure certificates of inspection each year in order to carry on their trade, the whole nursery industry of the State is absolutely dependent on our work from year to year. This has led some to think that it is our business to inquire into the manner and method of business of all such firms. Plainly, this is not the case, but when the certificate which we issue is put to an improper use, it becomes our right to interfere. The famous Amos Owen Cherry Tree Company is a case in point. Our certificate was granted to cover a legitimate trade, but when the nature of the business was changed, the parties continued the use of the certificate, and passed it from party to party as the management changed hands, without authority for so doing. When we became convinced that the business was not being conducted properly, and that our certificate was being misused, an investigation was made by the Entomologist, and the second day after his return, the concern was closed and the public was in possession of the facts. Further action against the parties was the work of the government, but the actual closing of the concern was the work of the Crop Pest Commission, through the Entomologist and the fact that this investigation and its results was accomplished at a cost to the State of less than twenty-five dollars is not the least among the arguments that the funds of the Crop Pest Commission are being used with proper and telling effect.

A short summary of the work of the past two years at this point may be well:

NURSERY WORK.

Number of nurseries inspected (45 each year)	90
Number acres of stock inspected (for two years)	1,200
Number plants in nurseries (for two years)	18,000,000

ORCHARD WORK.

Counties where scale is known to exist	22
Premises known to be infested (San Jose scale)	75 to 100
Number of trees infested (estimate)	50,000
Trees condemned and destroyed (estimate)	8,000
Trees treated for scale by owners (25,000 per year)	50,000

MILES TRAVELED BY ENTOMOLOGIST IN INVESTIGATIONS, ETC.

In 1901	6,000
In 1902	6,000
Total (2 years)	12,000

There has sprung up a large correspondence regarding insects and insect pests. The majority of such inquiries deal with injurious insects, but a number have come from persons in the State who are interested in observing insects generally, and who wish to instill a love of nature into those around them. The following letter is a sample:

"R. F. D., No. 1.
"MONROE, N. C., December 2, 1902.

"DEAR SIR:—What is this insect? I found it on my table in the schoolroom, and none of us know what it is. Please answer, after making an examination.

"Respectfully, ...,
"*Teacher.*

For the year 1902 the correspondence of the office has amounted to about 1,200 letters.

In order to know definitely just what kinds of insects are found in the State, a collection of specimens is kept, and is being added to constantly. Many of the specimens sent in by correspondents are preserved, and at every opportunity the Entomologist adds to the collection. It now contains about 30,000 specimens, which may be seen at any time in the office in the Museum building. This collection will become more and more valuable as it is made more complete.

Attached is a list of the nurseries of the State which have been inspected and duly licensed to do business from September 1, 1902, to September 1, 1903.

Very respectfully, FRANKLIN SHERMAN, JR.,
Entomologist.

NORTH CAROLINA NURSERIES LICENSED TO DO BUSINESS FROM SEPTEMBER 1, 1902, TO SEPTEMBER 1, 1903.

Name.	Address.	County.	Size.	Stock Handled, etc.
Anthony, G. L	Vandalia	Guilford	Medium	Fruits.
Baker, E. P.	Four Oaks	Johnston	Small	Fruits, Mulberries specialty.
Baxter & Petar	Ridgeway	Warren	Medium	Berries, specialty.
Biltmore Nurseries	Biltmore	Buncombe	Large	Ornamentals.
Blake, R. K	Lumberton	Robeson	Small	Fruits.
Bullock, R. D	Rocky Mount	Edgecombe	Small	Fruits.
Bullock, R. R	Ringwood	Halifax	Medium	Grapes, Scuppernong.
Carolina Nursery Co	Pine Level	Johnston	Small to medium	Fruits.
Continental Plant Co	Kittrell	Vance	Large	Strawberries.
Craft, N. W.	Shore	Yadkin	Medium	Fruits.
Dawson, A. J.	La Grange	Lenoir	Small	Fruits.
Edwards Bros	Stecoah	Graham	Small	Fruits.
Flinton, G. W. & Son	Durham, R. F. D., No. 2	Durham	Small	Fruits.
Green, J. W	Lemay	Wake	Small	Fruits, Mulberries specialty.
Herren, H. L	West Asheville	Buncombe	Small to medium	Fruits and Ornamentals.
Jordan, R. H.	Gulley's Mills	Wake	Small	Fruits.
Joyner, Nathan	Nashville	Nash	Small	Fruits.
Kelsey, Harlan P.	Kawana	Mitchell	Large	Ornamentals.
Killian, W. L. & Son	Startown	Catawba	Medium	Fruits.
Lamb, Jas. M	Fayetteville	Cumberland	Small	Evergreens, chiefly florist trade.
Lindley, C. C	Old Fort	McDowell	Small	Fruits.
Lindley, E. M	Pluck	Chatham	Small	Fruits.
Lindley, J. Van	Pomona	Guilford	Large	Fruits and Ornamentals.

Macon, Chas	Ingleside	Franklin	Small	Strawberries.
Magee, E. E	Highlands	Macon	Small	Ornamentals.
May, J. A. & Son	Canton	Haywood	Small	Fruits.
Middleton, F. G	Warsaw	Duplin	Small	Fruits.
Osborne, J. R	Bethany	Davidson	Small	Fruits.
Overman, W. R	Kenly	Johnston	Small	Fruits.
Pinehurst Nurseries	Pinehurst	Moore	Large	Ornamentals.
Ragsdale, J. R	Jamestown	Guilford	Small	Fruits.
Reynolds, L. A.	Craters	Forsyth	Small	Fruits.
Rhodes, C. M.	Wakefield	Wake	Small	Fruits.
Russell, Milford	Highlands	Macon	Small	Ornamentals.
Savage, B. O.	Cary	Wake	Small	Ornamentals, deals in fruit trees.
Shellem, Geo. E.	Raleigh	Wake	Small	Strawberries.
Spoon, A. T	Oakdale	Alamance	Small	Fruits.
Spoon, S. L	Pleasant Lodge	Alamance	Small	Fruits.
Startown Nursery Co	Newton	Catawba	Large	Fruits.
M. A. Throneburg Nursery Co	Newton	Catawba	Small	Fruits.
Turner, H. W	Thomasville	Davidson	Small	Fruits.
Underdown Nursery Co	Lenoir	Caldwell	Small	Fruits.
Warren, Allen	Greenville	Pitt	Small	Fruits.
White & Dameron	Lego	Guilford	Small	Fruits.
Young, Jno. A	Greensboro	Guilford	Large	Fruits.

Department Agriculture, Raleigh, N. C.

FRANKLIN SHERMAN, Jr., Entomologist.

REPORT OF STATE VETERINARIAN.

RALEIGH, N. C., December 19, 1902.

HON. S. L. PATTERSON, *Commissioner of Agriculture.*

MY DEAR SIR:—Pursuant to your request, I hand you a report of the work done by the Veterinary and Animal Industry Division since I took charge of the same, August 19, 1901.

ANIMAL INDUSTRY.

By legislative enactment the State Board of Agriculture is charged "with investigations adapted to promote the improvement of milk and beef cattle." In compliance with that command considerable effort has been made to arouse a greater interest in live stock husbandry and to disseminate information concerning the breeding and economical feeding of farm animals.

This work has taken the form of lectures at over forty farmers' meetings, in different parts of the State, contributions to the agricultural press and the Department Bulletin, a special Bulletin (July, 1902) on the "Breeds of Beef Cattle and Beef Production in North Carolina," and correspondence.

One of the test farms of the Department has been stocked with beef cattle and hogs, and experiments are now under way and contemplated to throw further light on the economical production of beef and pork, under the conditions existing on North Carolina farms.

To still further aid and encourage the improvement of our beef cattle a number of pure bred bulls and heifers have been brought into the State by the Department and the Agricultural Experiment Station and distributed among the farmers at actual wholesale cost.

There is no greater agricultural need in this State to-day than more and better live stock.

Our commercial fertilizer bills, now amounting to $6,000,000 annually, are at once the result of and reveal the absence of insufficient live stock husbandry in the past and emphasize the necessity for more in the future.

With the excellent facilities which our climate, soil, and abundant rainfall afford for the growing of forage crops, animal husbandry should not only enable the North Carolina farmer to improve the fertility of his soil and reduce his expenses for commercial fertilizers, but should also enable him to obtain better remuneration for his labor and skill and afford him a better market for the coarse products of his farm. This is particularly applicable to the central and eastern parts of the State where little or no live stock is grown and the fertilizer bills are consequently the largest. Yet no section of this or any other State is better fitted by nature for the growing of abundant and cheap forage crops, and, consequently, for the economical production of all kinds of live stock.

There is no doubt but the cheapest way to maintain and grow cattle is on pasture, and in those sections where the best cattle are grown land seems never to become too high-priced for this purpose. In some of the Northern States and Europe land valued at from $50 to $200 an acre is used for pasture and returns what the owners think a fair profit or interest on its value.

In North Carolina there are thousands of acres that can be bought for from $5 to $15 per acre that with proper management during an average season and pastured with good cattle will produce enough beef in one year to nearly pay for them. To do this, however, it would be necessary to give considerable attention to preparing them for pastures and to maintaining them in good condition afterward. But, with us, a pasture too frequently means a worn-out field, a rough hill or mountain side, or a low swamp that will produce but little, if, indeed, its stagnant water does not serve as a breeding ground for disease-producing agents. Such land will not produce sufficient pasture in quantity or quality to fatten good cattle; nor will an old field, that will no longer pay in corn or cotton, yield pasture that will grow 200 to 300 pounds of good beef during a season without considerable preparation and fertilization.

Unfortunately, the idea very generally prevails that it will not pay to use our best lands for pasture and the growing of forage crops for the feeding of cattle. Yet, there can be no doubt that in a properly balanced system of agriculture one of the principal, if, indeed, not the principal, object of the farming operations should be the growing of food crops for live stock. Until the erroneous idea that only those having large tracts of cheap land can make cattle growing profitable is completely dissipated and the small farmers begin raising a few good cattle and abundance of forage to feed them, we can never lessen that burdensome fertilizer tax of $6,000,000, now annually paid by the State, and put our agriculture on a permanently successful basis.

It is frequently stated that our lands are not well adapted to the growing of grasses and that those grown are not so nutritious as those of the North. It is probably true that cultivated grasses grown on rich soils are more nutritious than many of our wild grasses grown on poor soils, and it may be a fact that our abundant rainfall slightly lowers the nutritive value of our grasses, but this disadvantage, if indeed it exists, is more than equalized by the more luxuriant growth. However, neither chemical analyses nor feeding experiments give any foundation for the charge that our grasses and other forage plants lack anything in nutritive value when compared with similar plants grown in the North.

In fact, our best lands, under similar conditions, will afford more pasture, or hay, during a season than the average pasture or meadow lands of any of the principal stock-raising States of the Central West, as the following from the 1900 Year Book of the United States Department of Agriculture will show:

AVERAGE YIELD PER ACRE OF HAY—1891-1900.

State.	1891	1892	1893	1894	1895	1896	1897	1898	1899	1900	Av'g
	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons
Iowa	1.20	1.25	1.58	.73	1.08	1.74	1.50	1.75	1.34	1.42	1.359
Illinois	1.25	1.25	1.21	1.14	.66	1.38	1.29	1.56	1.29	1.27	1.230
Missouri	1.15	1.15	1.24	.85	1.17	1.43	1.15	1.60	1.37	1.29	1.240
Kansas	1.30	1.10	1.31	.77	1.21	1.42	1.30	1.46	1.57	1.32	1.279
North Carolina	1.10	1.20	1.70	1 45	1.63	1.26	1.25	1.70	1.50	1.41	1.420

It will be noticed that not only has the average yield of hay (grass) per acre been higher in North Carolina for the last ten years than in Iowa, Illinois, Missouri or Kansas, but another significant fact also appears, namely, that the yield was more uniform in North Carolina than in any of these hay growing States. The lowest yield per acre in North Carolina during any one of the ten years was in 1891, when it started at 1.10 tons per acre, but in 1894 Iowa, Missouri and Kansas only produced .73, .85 and .77 of a ton per acre, respectively, while in 1895 Illinois fell to .66 of a ton per acre.

These are important facts in their relation to stock raising, for the first essential of a grazing country is a uniform and abundant growth of grass which are assured to this State by our long summers and abundant rainfall.

As an illustration of the importance of increasing our production of forage crops, it may be stated that the fertilizer left in the soil by the roots and stubble, from a crop of cow peas, is worth from $3 to $5 per acre, which is little above its cost of production; while the ton, to a ton and a half, of hay secured is worth nearly as much, pound for pound, for feeding as wheat bran. The results of feeding trials actually show 1¼ pounds of peavine hay to be equal to 1 pound of wheat bran.

Not only is it important that we increase our production of forage crops, but it is equally important that these crops be fed to good live stock on the farm. Our present wasteful use of cotton-seed meal forcibly illustrates this point. About $2,000,000 worth of this most excellent cattle food is annually put directly into the soil as fertilizer by the farmers of this State. At the usual ruling market prices, peavine hay is as economical a fertilizer as cotton-seed meal, but it is rightfully thought too valuable a feed to be used directly as fertilizer. It is equally wasteful to use cotton-seed meal in such a manner. In fact, the growing of peavine hay for fertilizer would be much more rational and economical than the purchase of cotton-seed meal for that purpose; for, as previously stated, the growing of the peavine hay leaves in each acre of the soil from $3 to $5 worth of fertilizer, which is taken largely from the air.

If fed to cattle and the manure saved, fully 75 per cent of the fertilizer value of a ton of cotton-seed meal is returned to the farm. We, therefore, to obtain the other 25 per cent of its fertilizer value, costing about $6, sacrifice its entire feeding value. To fully show what this waste means it may be stated that numerous feeding trials, where both the feeds and the cattle were weighed, have shown that

One pound of cotton-seed meal is equal to 1.75 pounds of corn, and that one pound of cotton seed is equal to 1.13 pounds of corn. That is, when corn is worth 50 cents per bushel, cotton-seed meal is worth between $31 and $32 per ton and cotton seed $20 per ton, or 33 1-3 cents per bushel. Or, to reverse the statement, when cotton-seed meal is worth $24 per ton it is as cheap as corn at 38 cents per bushel, which is regarded by cattle feeders as sufficiently cheap to make cattle feeding profitable. It is, therefore, apparent that, owing to a lack of good cattle to consume this cotton-seed meal, we lose about $20 per ton on the 80,000 tons used as fertilizer, or a total of $1,600,000.

THE CATTLE QUARANTINE.

After it became established that the disease variously known in this and other Southern States as splenic, Spanish, Texas, or tick fever, distemper,

dry or bloody murrain, red water, acclimation fever, town-cow disease, etc., was naturally conveyed solely by the common Southern cattle tick (Boophilus Annulatus), the United States Secretary of Agriculture designated a line, extending across the country from the Atlantic Ocean to the Pacific, which was intended to divide the section infested with the cattle tick from that in which no ticks existed. No cattle from south of this line, that is, from the tick infested area, are allowed to be driven or in any way transported northward across this line, except under certain strict regulations, and then only for immediate slaughter. All of North Carolina was not permanently infested with this tick, but that part east of the mountains was, and, consequently, all of the State was subjected to these quarantine restrictions. But the Secretary of Agriculture has authority to exempt from the operation of this quarantine any district that is free of the cattle tick, where the State authorities will enforce such regulations as will effectually prevent ticks being carried into such district, giving assurance thereby that cattle for shipment originating within said district are unable to carry infection with them to other markets. In order to secure the advantages thus accruing the Department has co-operated with the United States Department of Agriculture and secured exemption from the quarantine restrictions for the sixteen transmountain counties of this State, thus securing a valuable saving to the cattle growers of that section.

To those familiar with the conditions under which Southern or quarantined cattle sell in the principal markets of the country, it is well known that because they can not go on to Northern pastures or into Northern feed lots, but must be sold for immediate slaughter or go back home, they sell from one-half to one cent per pound, live weight, below that brought by cattle of the same quality, but not under the quarantine restrictions. To this must also be added the cost of providing separate pens and unloading chutes and disinfecting the cars, which the Government requires the railroad companies to do. It is, therefore, evident that the gain to the sixteen counties of this State exempted from these quarantine restrictions is not less than from one-fifth to one-seventh the selling price. In 1899 these counties sold about $800,000 worth of live stock (estimated from the United States Census Report), which means a clear annual saving, by the exemption from the quarantine restrictions, of between $115,000 and $160,000. The total cost of maintaining the line across this State does not amount to more than $500 annually.

At the time these sixteen counties were first exempted from the operation of the Federal quarantine, considerable infection existed in a number of them, but by careful farm to farm inspections and a quarantine on the tick-infested farms, the infection has been controlled and at present is almost entirely eradicated, thus insuring for the future, freedom from quarantine restrictions.

EXTERMINATION OF THE CATLLE TICK.

Recognizing that the extermination of the tick was of vital importance to the cattle industry of the State, the Board of Agriculture, in co-operation with the Federal authorities, set aside the counties of Surry, Wilkes, Caldwell, Burke and McDowell as a field in which to make an attempt at such

extermination. What was then a theoretical probability has been proved a practical certainty by the work of the past three years. Caldwell County and the north half of Burke County have been cleared of ticks and are added to the exempted area for 1903. Furthermore, the tick has been so nearly exterminated in Wilkes County, also, that the Federal authorities have made North Wilkesboro a shipping point for cattle from the exempted area, thus bringing a boon to the cattle raising counties of Ashe and Alleghany, which have hitherto been compelled to drive their cattle a greater distance into Virginia to reach a railroad station from which they could ship.

In short, the feasibility of exterminating the cattle tick has been proved, and the work has progressed sufficiently to enable us to confidently predict the addition of one or more counties to the exempted area each year.

In the prosecution of this work, inspectors are employed who make a farm to farm canvass of the territory, with a view to locating all tick infested farms, which are immediately quarantined and the owners instructed as to the importance and objects of the work and as to the easiest and best means of exterminating the ticks on their places.

Daily reports are made to this office by the inspectors, showing the number of miles traveled, the number and location of farms visited, number of cattle inspected and the presence or absence of ticks. In this way the exact location of all the infected farms and cattle in each county is known and the work kept in hand so that an intelligent direction of it is possible.

During the past summer I addressed farmers' meetings relative to this work, at from six to ten places in each of the counties of Surry, Burke and Wilkes, as a result of which organizations were formed in all of these counties, which, through local or township committees, are co-operating with and helping the Department in the work to an extent and effectiveness never before realized.

That this work also pays may be shown by one illustration. The value of the live cattle sold from the farms of Wilkes County in 1899 was about $35,000 (estimated from United States Census Report). As previously shown, these cattle would have brought an advance of at least one-half cent per pound live weight had they been exempted from the quarantine restrictions; for it must be remembered that the price of all cattle in the United States, regardless of where they may be sold, is fixed by the Chicago and other large markets of the country. Therefore, the loss on these Wilkes County cattle for one year was not less than one-sixth, or $7,000. One-half this amount divided into four equal parts and expended during as many years will suffice to exterminate the ticks in Wilkes County. Likewise this easily exterminable pest may be eradicated from any county for a cost not exceeding the losses which its presence causes during any one year. This applies only to those counties in which the stock law (no fence law) is enforced, for in a free range country the extermination of the cattle tick is practically impossible.

LOSSES FROM TICK FEVER.

Another, and not the least important, phase of the tick question, as affecting the cattle industry of the State, is the extremely heavy losses from Texas

or tick fever. More cattle die from this disease than from all others combined. In the majority of cases the true nature and cause of the disease is little suspected, even by the owners, the animals dying before the ticks have grown large enough to be visible to the ordinary observer. These heavy losses are due to the fact that, even in what is known as the infected area, many farms are free of ticks and, therefore, the cattle raised on these farms are as susceptible to the disease as those raised in New York or Minnesota; for, in order to safely acquire immunity the calves must get ticks on them before they are six months old, which nearly always occurs on the tick infested farms. Hence, the freedom from losses when there are abundance of ticks, or none of them at all, and the heavy loses where there is any commingling of cattle from tick free and tick infested farms. This renders cattle traffic extremely dangerous in a large number of the counties of the State and results in losses, the aggregate of which are simply amazing to those not familiar with the conditions.

THE TICK AN OBSTACLE TO THE IMPROVEMENT OF THE QUALITY OF THE CATTLE OF THE STATE.

The presence of this pest over the greater part of the State offers the most serious obstacle to the improvement of our common cattle through the use of imported pure bred bulls.

All cattle that are over one year old before becoming infested with ticks are susceptible to the disease, and fifty per cent of them die. This renders the introduction of pure bred stock extra hazardous and expensive.

In recent years there has been developed a method of preventive inoculation, with blood from an animal previously infested with ticks. Susceptible animals are thus given a mild attack of the disease from which they usually recover and which enables them to withstand the infection introduced by the ticks.

During the past year I have inoculated some forty head of cattle for the farmers of the State. Of twenty-two head inoculated during the early part of 1902, and subjected to the test of a gross tick infestation during the summer, only one died from any cause; whereas, without inoculation not less than fifty per cent would almost certainly have died.

This work is done free of charge for any farmer in the State who may request it, in order to encourage the introduction of pure bred stock.

From the facts above discussed, namely, that the cattle tick reduces the price of all cattle sold in over eighty counties of the State, more than one-half cent per pound live weight, causes the death of more cattle than all other diseases combined, and is the greatest obstacle to the improvement of our common stock, through the intruduction of pure bred bulls, by rendering the same extra hazardous and expensive, it will be seen that its extermination is the most important problem affecting the cattle industry of the State, and should receive all the attention the resources of the Department can command.

A CERTIFICATE OF HEALTH MUST ACCOMPANY STOCK BROUGHT INTO THE STATE.

Since many communicable diseases exist in other States to a much greater extent than in ours, the State Board of Agriculture has very wisely required

a certificate of health from the live stock authorities whence it originates, to accompany all live stock shipped into the State for other purposes than immediate slaughter. Much difficulty has been experienced in enforcing this regulation of the Board, but by giving greater publicity to it, and insisting on its observance in all known importations, it is hoped this difficulty may be overcome and the live stock of the State protected from the spread of such diseases which always accompanies increased interest in and movements of stock.

Tuberculosis in cattle is one disease which illustrates the importance of the enforcement of this regulation. At present the general farmers' herds of this State are remarkably free of tuberculosis, and by insisting on a tuberculin test of cattle to be brought into the State for dairy or breeding purposes, it is hoped that this great scourge of the cattle industry of several of the Northeastern States may be largely kept out and our present advantageous condition maintained.

THE CONTROL OF THE DISEASES OF LIVE STOCK WITHIN THE STATE.

This Division can not, nor does it attempt to treat, individual cases of diseased animals, except by correspondence; still, it is the policy to visit all reported outbreaks of contagious or infectious diseases and all outbreaks of any disease which may effect a sufficiently large number of animals to render it of general interest to a community.

These duties have consumed considerable of the time and energies of the Veterinarian, the following being a brief summary of the work done:

Staggers.—A very fatal and extensive outbreak of the disease, commonly known in North Carolina as "Staggers," occurred in the counties bordering on Pamlico and Albemarle Sounds in August, 1901, just before I assumed the duties of State Veterinarian, but I was able to see the latter part of this outbreak and had a good opportunity to study a second outbreak, which occurred in Hyde County in November and December. In all, about a month was spent in that section, acquainting the people with the true nature of the disease and advising methods for its prevention. For a full discussion of this matter I refer you to the *Bulletin* of the Department for September, 1901.

Tuberculosis.—Tuberculosis (consumption), which has proved such a scourge to the cattle interests of many sections of this and other counties, is happily not common in this State. It does exist, however, in some of the larger and more closely confined dairy herds. It is the policy of this Division to apply the tuberculin test (an accurate means of determining the presence of the disease, even in its first stages), free of charge, to all herds, on request of the owners. Thus far 293 cattle have been tested and of these 35 have been found tuberculous. These diseased animals have been slaughtered, or quarantined, and their product sterilized before being used for food for man or other animals. Since the disease is now comparatively rare in the State this is an opportune time to endeavor to eradicate it. Such action is demanded by the best interests of the live stock industry and by considerations for the public health.

Glanders.—It is a source of gratification that this disease is almost entirely absent from the State. Of six suspected outbreaks investigated by the Vet-

erinarian, only one proved to be real, and, in that one, an early diagnosis and prompt repressive measures, energetically and carefully applied, succeeded in immediately stopping its spread and completely eradicating it.

Hog Cholera.—This disease is a source of great loss to the farmers of the State. Many outbreaks have been reported to this office. A few of these have been visited, and in all cases information concerning the best known methods of control and eradication have been given. Much of the ravages of this disease could be avoided by a better observance of sanitary regulations. The fact that the disease is due to a specific germ and can not break out in any herd unless that germ has been carried there by buzzards, or other birds, by running water, the wind, on the feet of visitors or attendants, by other hogs, or by coming in contact with the places or things contaminated by sick animals, is not properly appreciated by the average farmer, and as a result the disease is often spread when proper precautions would have prevented it. Proper regard for these facts, by burning all hogs dying of disease, excluding from the premises all visitors and others likely to have been where the disease exists and removing the well hogs (not the sick ones) to new and clean quarters, as soon and as often as a sick animal developes, would very greatly reduce the losses from this disease.

Blackleg.—Reports from the mountain counties of the State indicate that this disease is not uncommon in that section and occasions large losses among the young cattle of the best quality. Preventive inoculation has been demonstrated as a practicable and effective means of controlling the ravages of this disease. A small laboratory has been equipped by the Department for this Division, and it is our intention to manufacture and send out, free of charge, vaccine for the prevention of this malady.

During the sixteen months I have had charge of the Division of Veterinary Science and Animal Industry I have traveled on official business 14,500 miles by rail and boat, and 1,500 miles by carriage and on horse back. This, and my duties as Veterinarian to the Agricultural Experiment Station, and Professor of Veterinary Science at the Agricultural and Mechanical College, and the gradually increasing correspondence and office work connected with the direction of the quarantine and other State work, have combined to completely occupy my time and energies.

Very respectfully,

TAIT BUTLER,
State Veterinarian.

REPORT OF THE BOTANIST AND BIOLOGIST.

HON. S. L. PATTERSON, *Commissioner.*

At your request I submit the following report of the botanical and biological work of the Department during the two calendar years 1901-1902.

The work of the biological division of the Department is divided into two general lines, viz., Botanical or Agricultural, and Bacteriological or Hygienic. The botanical work includes the examination and testing of seeds; the furnishing of formulas for mixing seeds for pasture and meadow land; the identification and characterization of plants and weeds sent in by farmers; methods of canning and preserving fruits and vegetables; remedies for plant diseases, microscopical examination of flours and feed stuffs for adulteration, and many other lines related to agricultural botany. The encouragement of the silk-growing industry has occupied no small part of my time during the last year.

The bacteriological work of the Department was originally undertaken with a view of studying the bacteria of soils and manures, and the improvement of ferments used in dairy work, wine making and similar lines. In December, 1900, the Board of Agriculture ordered that the Biologist of the Department should also make analyses of drinking waters and other samples which might be sent for that purpose by the State Board of Health. This health work, small at first, has developed into such proportions that it has come to occupy the major part of my time, and has, in fact, driven me at times to the verge of exhaustion.

It would be impossible within the space of a report like this to describe in detail the work done by me in the last two years. I will refer to only a few examples. Cotton growers in the southeastern counties of the State have, of late years, begun to complain of serious ravages of an apparently new disease affecting that crop. Specimens of diseased cotton plants were examined by me microscopically and biologically. In the roots of the plants was found the spawn of a species of fungus, *Fusarium*, which is a common parasite of decaying roots in many soils. This fungus was undoubtedly the cause of the cotton disease, as its spawn filled the sap vessels or tubes of the cotton roots, thereby preventing the ascent of the water and food material required by the plant. A paper was published advising farmers having soil infected by this fungus parasite to avoid cotton and plant some crop not attacked by the fungus, thereby starving it out of the soil. The sweet potato, sorghum, broom corn, Bermuda grass, and various pasture plants and legumines were recommended for this purpose. The use of chemical sprays or special treatment of the soil will not pay, as the cost of clearing out the parasite would more than equal the value of the land. Further, to encourage the prescribed and necessary rotation on cotton farms, papers were published dealing with special uses of the sweet potato, the manufacture of starch, high-grade sorghum, syrup and brooms.

In the Department *Bulletin* for March, 1901, a comprehensive essay on canning and preserving fruits and vegetables was published, and ever since

frequent applications for particular information upon this subject have been received and answered. In the *Bulletin* for September, 1901, a paper on the "Poisonous Plants of North Carolina" was published. In the *Bulletin* for November, 1901, a paper on "Silk Culture" was published. This paper aroused widespread attention, not only in North Carolina, but throughout the whole country. The edition of the *Bulletin* was speedily exhausted and still calls were received for the paper. Another and much enlarged edition of the silk *Bulletin* was published in May, 1902. So many persons in the State expressed a desire to attempt silk growing it was judged expedient to send to Italy for a supply of silk-worm eggs. These eggs were distributed in lots of about one-tenth ounce to citizens in various parts of the State. The White Mulberry, upon whose leaves the silk worm feeds, is a very common tree throughout the Eastern and Central parts of the State, though it is nowhere sufficiently abundant to supply food enough to make silk growing a considerable industry. A "Feeding Chart" was prepared and sent out with the eggs to those rearing worms. By this means a satisfactory crop of cocoons was harvested after six weeks' work. Owing to the lack of sufficient and easily procurable mulberry leaves the work of feeding was much more onerous than it would be under the most improved system. On this account, and because of the inexperience of the silk growers, the amount of merchantable silk, or in other words, the weight of the cocoons was much less than it should have been. But that we had any silk at all worth selling or buying from this first and necessarily crude attempt at silk growing, speaks well for the future of the industry in the State. We have all along cautioned our people not to expect too much from silk culture. The profits from this business are never large. The work is recommended only for women and children who can carry it on at home in connection with their regular household duties. In this way silk culture should be regarded as a source of pocket money for the children, and a means of securing special comforts for the aged and feeble members of the family who are unable to do ordinary remunerative work. An average child of ten or twelve years may, by silk growing, earn in six weeks of spring $30 to $40. This sum is not large, but it is more than the average country-bred child ever owns at one time. It will purchase the coveted bicycle, camera, set of books, or other luxury which means so much to isolated children, and the possession of which will add greatly to the too few pleasures of modern farm life. The silk growing industry is one that must commend itself to all thoughtful minds, and to all who love the State, and desire to see the agricultural class enjoy more of the pleasures of prosperity.

During the two years covered by this report over 600 biological analyses have been made in the Department's laboratory for the State Board of Health. Most of these were analyses of drinking waters. A large number of examinations of milk and sputum for the bacillus of consumption were also made, and many examinations of blood for the parasite of malaria. This work has been well appreciated by the more progressive physicians of the State, and will probably lead to a higher plane of health in North Carolina, which has hitherto suffered from typhoid fever and malaria—two diseases easily prevented by the hygienic measures demonstrated and recommended by our work. Probably no work ever undertaken in the State has yielded more immediate

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or valuable results. In addition to the laboratory work carried on by me, I have had to attend to a very large correspondence, averaging about 1,500 letters per year. In addition, I have prepared and sent out to the press of the State a large number of special circulars of information, requiring a great deal of my time.

I propose no additional lines of work for the future. My time is already overtaxed by the regular routine work, which shows no signs of abatement, and which, during the summer months, is of volume sufficient to require the time of two or more men.

Very respectfully,

GERALD McCARTHY,
Botanist and Biologist.

REPORT OF THE CURATOR OF THE MUSEUM.

HON. S. L. PATTERSON, *Commissioner of Agriculture.*

SIR:—In the previous biennial report of the Curator a brief history of the Museum was presented, which may serve as an apology for not repeating this feature here. Nevertheless, a few words on the uses and reasons of a museum may not be out of place.

The legitimate work of a museum lies primarily in two different lines. One is as an educational institution, pure and simple, and the other as an institution for the encouragement of original research in natural phenomena. The latter phase has, so far, been regarded as beyond the proper sphere of our Museum, and even in the first phase our lines have been very properly restricted to the dissemination of knowledge regarding the natural resources and historical features of our own State. By means of series of selected specimens, properly classified and labelled, the educational work of a museum appeals to the eye, and the impression conveyed by the sight of a thing itself, coupled with the information regarding it that is displayed on the label, is much more lasting than that conveyed by a dry statement of fact.

It is desirable in a museum with a serious object in view that the curio feature be kept in the background, and that every effort be made to keep the legitimate work of the institution up to date and always moving forward. That means the unceasing quest of more and better specimens in all lines represented, and the management ought never to stop short of the best procurable of every line shown. The building of a museum is a never-ending work. A finished museum is a dead museum, and such a one must deteriorate and begin to lose usefulness from the time its growth stops. For the past decade the State Museum of North Carolina has grown steadily, and so long as the Board of Agriculture controls it in the progressive spirit that has animated it in the past, and still continues to give it life, its sphere of usefulness will continue to widen and increase in size and strength.

Our patronage includes most of the visitors to this, the capital city of the State. Included in this category are a great majority of those attending here in such capacities as members of the State Legislature, delegates to political conventions and to religious and educational conventions and meetings of all kinds. Students of the various schools and colleges all over the State, going to and from their homes and stopping over between trains, visit us in numbers, and the great summer excursions from north, south, east and west bring us thousands of visitors annually. The State Fair gives us a solid crush of patronage on the three big days, and a heavy attendance the rest of the week. Northern tourists to and from the resorts further south often stop over several days in Raleigh, and seldom fail to visit our Museum and appreciate what we have to show them. Winter visitors at Southern Pines and other places within our borders pay flying visits here during the season, and they, too, usually give us a call. Transients of all kinds send a fair percentage of their number up here, and the various schools and colleges of the city

make good use of their museum opportunities. Altogether, we have cause for congratulation in both the number and the quality of our patronage. Our attendance is now estimated to number about a hundred thousand visitors per annum, and is steadily increasing.

Since the last report was submitted the Museum has grown decidedly in its collections of specimens and in preparations for the display of the large series of stored material now on hand, although there has been but little added to the lines of specimens on exhibition for reasons that will be gathered from what follows:

Two years ago there had just been completed and turned over to the Department the latest addition to the building, but owing to press of other matters the finishing up and furnishing of this new annex was necessarily delayed, and it is only quite recently that the new rooms have been finally prepared for the reception of exhibits. Now, however, the work of installing exhibits in these rooms is under way and will be pressed to an early completion.

The growth of the Museum has been steady and very gratifying, and the routine work incident to the conduct of an establishment of this size has grown more quickly, proportionately, than it has been possible to supply assistance in handling it. Of necessity, therefore, certain lines of preparatory work that were planned have been postponed for the present, and only the more urgent ones taken up and carried out.

Pursuant to the sentiment on the subject expressed by the Legislature of 1901, the Board, at its June meeting of that year, provided funds for and ordered the making of an exhibit of the State's resources at the Charleston and West Indian Exposition, to be held in the city of Charleston, South Carolina, between the first of December, 1901, and the first of June, 1902. This exhibit was ordered to be drawn from the Museum, as far as practicable, and the work incident thereto was a prime factor in stopping advances in the general progress of installing lines of new specimens, as a large part of the Curator's time was, for more than a year, taken up with this additional work. The exhibit at Charleston was duly made, and, judging from what was said of it, both in the newspapers, by experts in those particular lines, and by the thousands of North Carolina visitors that saw it there, it was one of which any State might be proud. More detailed information regarding it will be found in the report of the committee appointed to examine and report on the display. The Curator was in charge of the exhibit during the closing months of the Exposition and superintended the packing and shipping of the exhibits back here. The work of reinstalling them in the Museum is now going on, and that, together with the arrangement and display of all the accumulations of the past two years, will be carried steadily forward to the earliest possible conclusion consistent with proper care in the arrangement and labelling.

The Museum is divided into the following divisions:

Agriculture and Horticulture.—The main exhibition series of grains and seeds is shown in rows of glass tubes, a new method of display that has met with a very general approval. The tubes are nearly four feet long and over two inches in diameter, and they show up the details and characters of the contents better than any method heretofore used in any museum of which the writer has knowledge.

The fruits are shown in glass jars, put up in liquid preservatives, and the collection is quite comprehensive in character, showing as it does the products of the extreme East, of the sandhill country, of the middle section, and of the mountain counties.

Forestry.—This collection has been much added to since the last report was submitted, and when once more properly classified and rearranged, the increase and improvement will be very manifest. The chief additions are a lot of new plank specimens, representing species not before in the collection, and a large series of discs, showing normal and abnormal annual growths and other features having more or less bearing on practical forestry. These additions are particularly valuable, bringing out points of importance that it was before impossible to show.

A collection of dried specimens of the medicinal herbs of the State is another feature in this division and a beginning has been made in the line of economic plants other than those mentioned above.

Mines and Mining.—The native rocks are shown in a large series that will be very greatly added to as soon as the additional material can be properly arranged and labelled, the additions referred to being already on hand. The same may be said of the ores and the other economic metalic and non-metalic minerals and building stones, which are already shown in a great and varied profusion. In the systematic minerals there is a very fine collection of what the State produces, one room being devoted entirely to this feature in geology. Altogether, the economic value of this display to the State is perhaps greater than that of any other feature of the Museum, and it is the object of the management at all times to be able to show to the prospector or intending investor specimens of any native product he may be looking for.

Anthropology.—This division, that of "Man and His Works," is with us confined to an exposition of the lives and history of the people of the State, both in ancient and modern times. It may be divided into two sub-divisions, viz., that devoted to the Indian or other pre-historic races formerly living within our borders, and that of North Carolina history. In the former we have a great deal of interesting material on display, including a fine lot of specimens of stone implements and weapons. In the latter we are now rearranging the whole exhibit, this being made necessary by the increase in accessions having been for some time past much in advance of available space in which to display the specimens. This is a very valuable and popular division.

Zoology.—The principal lines on which this division has been developed are those relating to the commercial fisheries and to the native game birds and animals of the State, both being valuable features, representing much natural wealth. A large series of handsomely mounted specimens of the principal species in the above lines are shown and are being continually added to as new things come to hand. As in all other divisions, there are large and varied accumulations that have for some time past been awaiting the room that is now available for their display, and this line is now being put on exhibition as fast as it can be properly handled. The general fauna of the State is also being worked up, and when that is completed the Museum will be able to present to the visitor a complete exposition, so far as is practicable, of the

animal life of the State, from the highest to the lowest forms, a display of vast value to all seeking enlightenment along these lines.

Beyond the above, there are on exhibition a large series of photographs of State scenes and institutions, which have proved of particular value in the case of visitors from a distance seeking specific information on various phases of our resources. Fresh views are accumulating continually, as the Museum officials make a point of photographing everything coming to their knowledge that is illustrative of what the State is, what it produces, and what it is doing.

I may say, in conclusion, that we have every reason to be proud of the place our State Museum occupies among similar institutions the country over. I have personally visited most of the more important of those of the Eastern States, and I speak knowingly when I say that ours is ahead of any museum south of Washington, so far as my knowledge goes, in the lines on which it was conceived and has been developed; and with the hope that its future growth may even surpass what has been done before, this report is respectfully submitted.

H. H. BRIMLEY,
Curator and Zoologist.

EXTRACTS OF INTEREST FROM THE DEPARTMENT OF AGRICULTURE BULLETIN.

ANALYSES OF MARLS.

From the large number of marls, and supposed marls, sent to the Department for analysis, the ones of best quality have been selected for presentation here. Good marl contains fifty or more per cent—the more the better—of carbonate of lime, which is usually the most valuable constituent in it. Some marls have, in addition to the carbonate of lime, some insoluble phosphoric acid and a few of them contain small amounts of potash. Samples Nos. 301, 302 and 401 have enough phosphate of lime to add considerable to their value, the first being marls of very high grade. No. 303 is really a phosphate, as it has 25.45 per cent of phosphoric acid. South Carolina phosphate rock sells on basis of 26 per cent of phosphoric acid.

Marling improves a great many lands, especially the light, sandy ones, where lime is often deficient. It should be put on broadcast, preferably in the fall, to give exposure to the freezing and thawing of winter.

RESULTS OF ANALYSES OF MARL

Laboratory Number.	Post-office Address of Sender.	County from which Sample Came.	Percentage Composition. Insoluble Matter (mainly sand).	Calcium Carbonate.	Phosphoric Acid.
350	El Paso	Brunswick	11.47	86.77	.71
545	Elizabethtown	Bladen	73.80	15.48	.20
89	New Bern	Craven	38.39	54.36	.87
281	New Bern	Craven	57.80	32 43	.50
301	New Bern	Craven	2.96	88.07	1.22
302	New Bern	Craven	4.58	85.72	1.32
303	New Bern	Craven	10.11	12.92	25.45
170	Wallace	Duplin	79.06	--------	.25
45	Benson	Johnston	63.21	19.75	.33
401	Wilson's Mills	Johnston	--------	57.18	1.00
583	Richlands	Onslow	59.97	31.28	.41
584	Richlands	Onslow	94 56	--------	.19
365	Willard	Pender	49.33	44.58	.50
366	Willard	Pender	50.62	45.03	.50
367	Willard	Pender	50.52	44.62	.50

LIPPS' MANUAL OF SECRET PROCESSES FOR THE MANUFACTURE OF HOME-MADE FERTILIZERS.

BY B. W. KILGORE, STATE CHEMIST.

A twenty-page, copyrighted pamphlet with the above title has been, and is being sold, to the farmers of the State, mainly in the west, for $3.00. One of these pamphlets has come into my hands, and quite a number of letters have been received by the Department from farmers in regard to the "Secret Processes" in it. Some of these letters have contained the names and amounts of the materials used for making the "Complete and well-balanced fertilizers" for all crops.

I have read the Manual with care, as also the circulars that have been distributed broadcast for the purpose of advertising the Manual and supposed "Secrets." The circulars and advertisements, which are given away, contain among others, these statements: "Millions of dollars can be saved to the farmers of this country by making their own fertilizers. Since one of the most wonderful, scientific, far-reaching and beneficial inventions of the nineteenth century has been brought out by Prof. Michael M. Lipps (a noted chemist), who has thrown the powerful search-light of the laboratory upon the farm in behalf of the farmers, and the result has been the production of a process which has even astonished the scientific world. Just think of it! The farmers using this method can produce a complete and well-balanced fertilizer. Good for all crops, at the small cost of between four and five dollars per ton. Was such a thing ever dreamed of before? It is really the acme of the most profound scientific investigation and will challenge the world to produce a process equal to it. Remember it is no untried experiment, but instead, it is a well-established fact. * * * I have published a Manual of Instructions, giving full and plain directions how to make the fertilizer by this process. * * * Every farmer should have one of these Manuals, which includes a Farm Right to make and use on his own land, or any he may cultivate. * * * When you read this circular, don't class this process with impracticable schemes you have known or heard of in the past. For I have the only truly tested and practicable process ever known by which the farmers can really and successfully make their own fertilizers. * * * This process is fully protected by the law of the United States. and they will be rigidly enforced against any person infringing on the same. Farm Rights for sale, $3.00."

The language employed above is strong and startling. It is such as would lead some people to believe that something really fresh and new in the way of a great scientific discovery has been worked out by the author of the Manual. I have been unable to find between the covers of the Manual, which is claimed to contain the so-called "Secret Processes," any evidence whatever of "wonderful scientific, far-reaching and beneficial inventions," or of a single process that would "astonish the scientific world," or any other world, unless it be the use of a certain material in the compost as plant food, which has no direct value as such, and the further unscientific procedure the directions

give for mixing the "chemicals" in the fertilizer for "all crops." As the Manual is copyrighted, and the force of the law threatened upon anyone infringing on the right of the process, I will not be more specific in regard to these references, but the practice in regard to them is such as would not be endorsed by anyone familiar with the subjects of plant food, fertilizers, and the action of chemicals on each other. I have no hesitancy whatever in staking my reputation and standing as a chemist in making the assertion that there is not a new fact, a new statement, or a new anything in either the Manual or "Secret Processes." It is right to be fair and just, and to this end I am glad to state that the Manual is, as a rule, a fair and correct statement, as far as it goes, as regards fertilizer materials, their sources and uses. But there is nothing new in this. Such information has been given to the public a great many times, and in different ways in the agricultural papers, books, and other publications. There is no reason why farmers should be charged $3.00 for what is in this twenty-page pamphlet, under the guise of something new, when they can obtain the same and more information on the subject of fertilizers, their sources, and uses for different crops, in the best agricultural books for $1.00, and from the Department of Agriculture—in its *Bulletins* and by correspondence—without cost. These books are by recognized authorities. I say this, because the author of the Manual in question claims to be a noted chemist, and yet, so far as I know, he is not known to the chemical profession as a chemist.

On January 2d, a letter was sent to Professor Lipps containing the above statements and informing him that it was written in my official capacity as State Chemist, whose duty it is to protect the farmers of the State from misrepresentation in regard to fertilizers and to advise them on this subject, and further stating that ten days would be given him in which to make known his position, after which time the matter would be given to the public. He has not replied.

Professor Lipps lives at Bluff City, Tennessee, his North Carolina address being Lenoir. His method of business is to sell county rights. We know of one county contracted for, for $300.

To the above it is only needed to add that the materials employed in the "Lipps' Processes," with the exception of one, which is not valuable as plant food, are the same as those used by fertilizer manufacturers and farmers for making and mixing fertilizers, and there is nothing new in the so-called "Lipps' Process" of mixing and composting that will add value to them. The small quantities employed make them cost the farmer more than if he bought in larger quantities from regular manufacturers and dealers in fertilizers and fertilizer materials.

Any farmer desiring to mix his own fertilizer, or to compost fertilizer materials with barn-yard manure, rich dirt, wood's mould, etc., can obtain formulas and directions from this Department without cost. Considerable information of this kind has already been given in *The Bulletin*, and other formulas and instructions suited to special conditions will be furnished on application. We will not claim anything new for these, but they will be good, reliable formulas that have been found to give good results in farm practice.

We advise farmers not to purchase the "Lipps' Processes," or any other process or formula for mixing and making fertilizers.

ANALYSES OF IRON ORES.

BY S. E. ASBURY.

A great deal of interest was manifested in iron ores in the early part of the past year, and, as a consequence, quite a number of samples came to this laboratory for analysis. The results of a number of these examinations are presented in the table, and it is thought that some general remarks on the subject of iron ores may not be out of place here.

A good iron ore must contain at least 50 per cent of metallic iron. They vary between 50 and 70 per cent. A picked sample from a deposit will run from 5 to 10 per cent higher than the run of the mine; hence, parties selling in ton lots may expect lower percentages than from their prospecting samples. The ore should have little or no sulphur; nothing higher than .10 per cent, if that. However, sulphur is not a bane of North Carolina ores. A good limonite ore can have .3 to .5 per cent of phosphorus and be salable; and if there are near to blast furnaces available deposits of non-phosphorus ores of hematite or magnetite, a limonite running from .5 to .75 per cent phosphorus can be used. Ores running as high as 3 per cent phosphorus are more valuable than those running from 1 to 2 per cent, for they can be used in the open-hearth process. Ores containing from 1.50 to 2.50 per cent phosphorus are of no value at this time. Ores should not contain more than 15 per cent silica, of all kinds, as all silica above this reduces the efficiency of the lime flux. One-half per cent titanium renders the ores valueless, as the titanium soon chokes the blast by forming an infusible slag.

Only non-sulphur, and practically non-phosphorus ores, are available for making the finer grades of iron and steel. They are usually hematite and magnetite. For foundry iron, limonite ores, containing the minimum percentages previously mentioned, are available.

The limonite ores of central North Carolina, particularly in Johnston and Wake Counties, are notable additions to the iron ore resources of the State. By analyses and suggestions, this Department has done a great deal toward developing and starting operations in the mine at Wilson's Mills, in Johnston County. Sufficient work has been done to demonstrate the quantity and quality of this class of iron in this section. Distance to coal is a drawback to their extensive use.

Ores of excellent quality have been examined from Ashe, Buncombe, Burke and Watauga Counties, and it is likely that these will come into extensive use in the future.

RESULTS OF ANALYSIS OF IRON ORES.

Laboratory Number.	Post-office.	County in which Deposit is Located.	Kind of Ore.	Per Cent of Iron.	Per Cent of Sulphur.	Per Cent of Phosphorus.
382	Jefferson	Ashe	Magnetite	61.20		
49 (I)	Weaversford	do	Specular hematite	67.50		
538	Fair View	Buncombe	Magnetite	62.86		
482	Burkmont	Burke	Red hematite	62.24		
480	Chambers	do	Magnetite	35.86		
481	do	do	do	62.65		
414	Table Rock	do	Limonite	54.41		
317	Hickory	Catawba	do	52.05		
22	Jug Town	do		56.16		
242	Pittsboro	Chatham	Specular hematite	50.68		
7 (I)	Peachtree	Cherokee	Limonite and magnetite	48.70		
13 (I)	Oxford	Granville	Magnetite	59.39		
18	Greensboro	Guilford	Titaniferous	58.40		
364	Angier	Harnett		15.45		
6 (I)	Granite Hill	Iredell	Magnetite	66.94		
33 (I)	Kenly	Johnston	Limonite	21.45		
294	Leachburg	do	do	45.95		
295	do	do	do	35.56		
314	do	do	do	55.30		
362	do	do	do	48.90		
363	do	do	do	43.81		
140 (I)	do	do	do	53.58		
455	Lunar	do	do	54.41		.69
72 (I)	Polenta	do	do	53.06		
113	Wilson's Mills	do	do	43.16		
124	do	do	do	52.26		
125	do	do	do	49.89		
175	do	do	do	51.18	.71	1.12
217	do	do	do	47.51	.06	.97
254	do	do	do	56.66		
255	do	do	do	34.56		
256	do	do	do	54.28		
257	do	do	do	53 59		
258	do	do	do	51.54		
65 (I)	do	do	do	33.44		
66 (I)	do	do	do	51.03		
67 (I)	do	do	do	23.78		

RESULTS OF ANALYSIS OF IRON ORES—Continued.

Laboratory Number.	Post-office.	County in which Deposit is Located.	Kind of Ore.	Per Cent of Iron.	Per Cent of Sulphur.	Per Cent of Phosphorus.
68 (I)	Wilson's Mills	Johnston	Limonite	31.51		
69 (I)	do	do	do	27.24		
292	Franklin	Macon	Specular hematite	55.20		
224	Jamesville	Martin	Limonite	52.96		
247 (I)	Carthage	Moore	Red hematite	66.77		
198 (I)	Garysburg	Northampton	Limonite	36.89		
95 (I)	Hillsboro	Orange	Specular hematite	23.89		
12 (I)	Timberlake	Person	Trap Rock	22.76		
265	Bethel	Pitt	Limonite	21.34		
197 (I)	Greenville	do	do	25.76		
77 (I)	Madison	Rockingham	Magnetite	69.03		
5 (I)	Holly Springs	Wake	Limonite	51.27		
60	Myatt's Mill	do	do	50.36		
236	Raleigh	do	do	40.22		
238	do	do	do	35.63		
262	do	do	Specular hematite	37.51		
337	do	do	Magnetite	66.48		
417	do	do	do	68.83		
425	do	do	Limonite	53.17		.62
426	do	do	do	43.69		
427	do	do	do	50 49		
428	do	do	do	49.67		
429	do	do	do	52.96		1.28
430	do	do	do	53.79		
437	do	do	Red hematite	61.01		
28 (I)	do.	do	Specular hematite	54.48		
34 (I)	do	do	Limonite	50.42		
82 (I)	do	do	Specular hematite	66.88		
234 (I)	do	do	Red hematite	62.75		
250	Roger's Store	do	Magnetite	49.10		
20 (I)	do	do	Limonite	55.93		
44 (I)	Wyatt	do	Magnetite	63.03		
162 (I)	Boone	Watauga	do	58.12		
138 (I)	Dark Ridge	do	Red hematite	65.95		
235	Goldsboro	Wayne	Limonite	50.58		
585	do	do	do	34.83		

SORGHUM SYRUP AND BROOM CORN.

"*N. C. Department of Agriculture.*

"GENTLEMEN:—I have been making sorghum syrup for home use in a small way, but never could sell much. I am told that a good syrup will sell and am anxious to try it. Please give me full particulars how to plant, grow and boil a syrup that I can sell; also, tell me how to grow the broom straw used in making the brooms we buy. How could be secure a broom factory in this neighborhood? J. L. R."

The sorghums are all true grasses, natives of hot and dry regions. There are saccharine or sugar-producing species and species which contain but little sugar. Among the latter are the broom corn and the well-known Johnson grass—the best sorghums for sugar or syrups in North Carolina are "Orange" and "Folger" canes. The seed of these can be had of any of the larger seed houses. The seed is apt to be of poor quality. A sample should be obtained and tested before purchasing. About 7 pounds of good seed is sufficient to sow one acre. The seed is planted about cotton-planting time.

The sorghums will grow upon any land that will make cotton or corn. They are nearly drought-proof after they are well started. Rich, moist bottoms are not suitable for this class of plants, except when grown for forage. A medium sandy upland which has had a crop of crimson clover turned under is the best. The land should be deeply broken and well fined with a harrow before sowing the seed. Sorghum plants are very feeble at first, and on poorly prepared land are liable to be smothered by weeds.

Sorghum is a hard feeder and one that it will pay to fertilize well. The following formula for compounding a ton of fertilizer can be strongly recommended:

	Pounds.
Acid phosphate	1,200
Sulphate of potash	250
Nitrate of soda	150
Cotton-seed meal	400

Mix and use from 300 to 500 pounds per acre.

If a clover crop or strong clover stubble has been turned under, the cotton-seed meal may be omitted. But for starting this crop and getting ahead of the weeds nitrate of soda is unexcelled. Kainit should not be used on this crop. The sulphate of potash is much better than the muriate. The fertilizer should be drilled in with or before the seed—make drill about 3½ feet apart. Chop to a stand of one plant every 4 inches in drill. The drills should be on the level, not ridged. Cover seed about one inch deep—most of the one-horse corn-planters used in this section have dropping rings for sowing sorghum. The young plants must be carefully cultivated or they will be smothered by grass and weeds. Usually one hoeing and three cultivatings are needed. The crop is laid by when the seed heads emerge from the sheaths. The crop is

ready to cut when the seed tops turn brown. The crop may be harvested with a mower or self binder or with heavy corn knife. The canes should be cut close to the ground. Allow to lie in windrow 24 hours or more before grinding. The yield of Orange sorghum is 12 to 15 tons as hauled to mill. The Folger gives a somewhat less yield, but richer cane. From one acre of either cane one ton of refined sugar or 175 to 200 gallons of high-grade syrup can be made.

In North Carolina, either Orange or Folger cane will give two cuttings if planted not later than April 15th. Usually only the first cutting is used for sugar or syrup—the second being used as forage.

The cane is ground between heavy steel rollers. There are several good mills on the market. The most economical is the so-called four-horse power mill. This can be run with two horses if necessary. The best way is to work the crushing mill in forenoon only. Then give all hands to rushing the juice through the various tanks. If any unconcentrated juice stands over night, fermentation usually sets in and this spoils the flavor.

Run the juice from the crusher into a strainer to remove trash and dirt. A good strainer may be made by boring holes in bottom of a clean dry goods box and putting into this a layer of clean, finely chopped rye or wheat straw. This may be 3 or 4 inches deep.

From the strainer the juice should be run into a heating tank, which may be heated either by steam-coil or direct fire. Heat the juice until it begins to boil, then draw the fire and add to the tank for each 50 gallons of juice 10 pounds of finely powdered brown or yellow clay mixed in enough water to make a stiff batter, and one pint of lime whitewash of the consistency of cream, or as usually used in whitewashing. Stir and beat the juice until a thick foam cap forms, then let it settle, which will take from one to three hours.

From settling tank, by means of a syphon or the "turn pipe" supplied by manufacturers, run off the clear juice into the evaporator. Add half its bulk of clean water to the dregs in the settling tank. Let it settle again and run off the clear juice as before. Throw away the sediment.

Boil the juice in evaporator, skimming off the scum, until a measured gallon weighs about 12 pounds. The syrup is now complete.

It should be at once run off into small open vessels and allowed to cool as quickly and completely as possible. Keep it covered until used. Very great care must be exercised to keep all vessels clean and to rush the process from the grinding mill to the storage cask. Dirty vessels and slow work will cause fermentation and badly flavored syrup.

The process as above outlined is very different from the crude, unclean and imperfect method used by most farmers. But in this case the greater care will be fully repaid in the superior quality of the syrup. The reason why stores do not want ordinary farm-made syrup, is because the syrup contains so much impurities that the flavor is repugnant to most civilized palates. But a syrup made by the above-described process from cane harvested at the proper stage of ripeness will be delicately flavored equal to the best open kettle Louisiana molasses, which usually sells for 60 cents per gallon.

As to broom corn: The best variety is the Tennessee Evergreen. The culture, manuring, etc., are the same as for syrup cane. The seed-tops, or "brush," is the merchantable part. The brush is ready to be bent down (to keep the straw straight) soon after the bloom falls or when the seeds begin to form, and it should be cut soon after. Older brush is inferior. The brush must be carefully handled and quickly dried under cover, laid in straight rows, so that it will remain a bright green color, and cure the brush straight. The seed should be removed before curing the brush. This is done by means of a wood-saw-tooth comb, or in a larger way by a revolving drum, which has saw-like teeth, which comb out the seed.

The clean and dried brush is usually put up in small bales, with the straw to the centre, and the stems exposed at the ends. The principal markets are Chicago, Baltimore and New York. The School for Blind in Raleigh has a broom factory and probably will buy good brush. Apply to Mr. Jno. E. Ray, Superintendent.

Brooms can not with any profit be made on the farm. A small factory, working up the produce of 300 to 500 acres of land, can be established and maintained in every county of North Carolina east of the Blue Ridge. At present nearly everyone in North Carolina uses foreign-made brooms, sugar and syrup, which might just as well be produced in the State and neighborhood, thereby saving freight and merchants' profits, besides furnishing employment for your own folks and neighbors.

If you can induce enough farmers in your county to put in sufficient sorghum and broom corn to run a small factory—say 300 to 500 acres—capitalists can no doubt be found to supply the plant. The manufacturers of machinery usually send experts to set it up and instruct owners how to use it. There is nothing very recondite or difficult in the manufacture of syrup or brooms. As to cost, a small broom factory, with steam or gasoline engine of four-horse power, will not cost over $1,000 for machinery. A syrup factory will cost even less. This much capital can be raised in your locality, if you will adopt the installment plan, paying in weekly or monthly installments, until the shares are paid. The writer will furnish names of dealers in machinery to those who mean business. There can be no manner of doubt as to the adaptability of your soil and climate for both sorghum syrup and broom corn. It is equally certain that home markets can be found to take all the first-class goods you could make for some years. But if you grow only the broom "brush," and ship it to Baltimore or New York to be sold to the broom trust, you will probably have the *experience* for your reward and very little else. The stories of enormous profits in growing broom brush are not true.

Respectfully,

GERALD MCCARTHY,
Botanist.

THE BACTERIOLOGY OF HOG CHOLERA.

BY GERALD MCCARTHY, BOTANIST AND BACTERIOLOGIST.

The annual loss caused by hog cholera in the United States is above $100,-000,000. The direct annual loss by this disease in North Carolina, and the indirect loss by discouraging swine breeding, have been very heavy. Hog cholera is a zymotic or bacterial disease. It is to the hog kind what typhoid fever is to human. The two diseases and the germs which cause them are very closely related. Both diseases are transmitted by infected food, or drinking water. The bacterium, or germ, which causes hog cholera, is able to live in water and moist soil for eight or ten months. It is, therefore, a very difficult operation to disinfect a pig-pen or lot in which diseased hogs have been kept.

Several States, notably Iowa, which State loses annually from hog cholera not less than $12,000,000, have tried by State inspection and slaughter to stamp out the disease, as has already been done over the entire United States for pleuro-pneumonia of cattle. In Page County, Iowa, in 1897, such an attempt was made. During the preceding six months that county had lost by cholera 12,849 hogs, worth about $38,000. During the next six months, under State inspection, and slaughter of suspected animals, the loss was reduced to 1,111 hogs. The total cost of inspection, slaughter and remuneration of owners of slaughtered hogs was about $10,000. This left a handsome profit. But the cost of an efficient inspection and slaughter law for an entire State is so enormous that it must be considered at present as impracticable.

In Kansas, in 1900, the following experiment was made by the Jensen Creamery Company, at Beloit, Kans.: Twelve shoats were inoculated with anti-toxic hog cholera serum. They were then turned into a pen where a hog had just died of cholera and whose carcass still remained. The inoculated hogs showed not the least sign of disease. They throve as well as any hogs could, and after being kept in the infected pen for 93 days, under the most favorable circumstances for contracting the disease, they were sold for pork. The hogs had gained an average of 196 pounds each, showing that their health was of the best during the entire period.

The above experiment is published and vouched for by the Kansas Agricultural Experiment Station.

It must be understood, however, that the anti-toxine treatment, can not be expected to act favorably in every case. No medicine or method will do this. But experiments in different States show that the anti-hog cholera toxine renders inoculated hogs immune in about eighty to ninety per cent of treated cases. When well hogs are inoculated they never afterwards contract hog cholera. But if a pig which has contracted the disease is inoculated as soon as the first symptoms appear, in above sixty per cent of such cases the pig will be cured and will not again contract the disease. The anti-toxine is both a preventive and a curative.

Anti-toxic hog cholera serum is prepared by injecting into the arteries of healthy cows or horses a virulent culture of the hog cholera germ—*Bacillus*

cholerae suis. Cows and horses do not contract the disease. The injection is repeated several times at intervals of a few days. In a month or so the blood of the injected animals attains its anti-toxic quality. A little of this blood—sixteen to thirty-two drops—injected under the skin of a pig, will render that pig immune against future attacks of hog cholera. There is no danger attending the inoculation of the pig. The anti-toxic blood does not contain the hog cholera germ, but an euzyme, or ferment.

At present the anti-hog cholera blood serum is being prepared in large quantities by the United States Department of Agriculture. Small trial quantities are sent free of charge to those who wish to treat the serum on their hogs. It is not sent to physicians or those who charge for inoculating animals. The serum can also be bought of druggists. Enough to inoculate two pigs costs about thirty cents. A hypodermic syringe, such as is used in making injections of morphine, is used to inject the anti-cholera serum. This syringe can be bought for about 50 cents. Anyone who can inject morphine can inject the serum.

This method of preventing loss by hog cholera should be tried by every swine-grower in the State. By its use four-fifths of the present animal loss by cholera can be prevented.

CANNING, PRESERVING AND EVAPORATING FRUITS AND VEGETABLES.

BY GERALD MCCARTHY, BOTANIST AND BIOLOGIST DEPARTMENT OF AGRICULTURE.

The art of preserving foodstuffs in air-tight glass and tin vessels was invented by a Frenchman, M. Appert, in 1810. Appert was a cook in a wealthy family. His culinary experience taught him the great value of such a process.

The canning process is based upon the scientific principle that fermentation is due to living germs or bacteria.

When the foodstuff is enclosed in an air-tight vessel and heated hot enough to kill these germs, there can be no fermentation until the can is opened.

The canning industry in the United States has increased year by year. The census of 1889 showed the annual output to be 600,000,000 cans, worth about $48,000,000. About 1,000,000 persons were employed in handling the goods, and 1,500,000 acres of land in growing the raw material. Since 1889 the canning industry has increased at least 50 per cent. There is among the general public a belief that there is something mysterious in the commercial canning process. Canners themselves try to conceal their methods under fanciful or ambiguous names. But the principles of canning are very simple and are known and practiced by every housewife who puts up a few jars of fruit from her own garden.

The principle of the canning process is based, as has been said, on the fact that fermentation is due to living organisms—bacteria and molds. If we heat food in a vessel closed from the air we kill all the fermentative germs within and no more can get in so long as the package remains air-tight, thus fermentation is prevented and the food keeps indefinitely. Some germs are

difficult to kill in the spore stage. These require to be heated to not less than 240 degrees F. for one time, or to 212 degrees F. for three successive times. All the common berry fruits, peaches, apples and tomatoes are successfully sterilized in tin cans by one heating or "process" at 212 degrees F. But green peas, corn and all animal products require 240 degrees F. to insure safe keeping. The use of temperatures above 212 degrees F. requires a strong closed kettle or boiler. Of late years chemical manufacturers have been urging canners to use salycilic acid, borax and other poisonous chemicals sold under fancy and misleading names for preventing fermentation in canned foods. These poisons are always harmful. Their use in canned food is wholly unnecessary, and in many States such use is even illegal. The uncontrolled use of antiseptics in food is always dangerous to health. Cleanliness, proper attention to sealing the cans and exposure to sufficient heat will preserve canned foods without the addition of any chemicals whatsoever. Not even sugar is essential to preservation of properly canned food!

In practical canning it is found that the open-kettle process which can not give a temperature above 212 degrees F., is the easiest to manage and turns out the best quality of goods. But the closed-kettle process, which will give any desired temperature, is more rapid and certain in its results. When quantity is of more importance than the quality the close kettle is preferred. In practically all large commercial canneries the heat is applied by means of steam. The usual plan is to have a coil of perforated steam pipe in bottom of the kettle or tank. Still, many old-fashioned canning houses and small farm canneries use heavy iron kettles set in brick and heated directly by coal or wood fire. The furnace process and outfit is much cheaper than the steam-heat outfit. We recommend steam heat and open-kettle process for berries, fruits and tomatoes. All other vegetables, as well as meats and fish, require the closed-kettle process.

The following estimates on canning machinery and outfits are furnished us by a large manufacturer of such goods:

PLANT NO. 1.

Estimated amount and cost of machinery for outfit of 2,000 cans capacity per day of 10 hours.

We here figure on open-bath, steam-heat process. Articles not wanted can be omitted at prices given:

1 16-horse power boiler, *complete with all trimmings*, and including proper piping and fittings necessary for connecting boiler with tanks	$190.00
1 Scalding Tank, diameter 36 inches, depth 24 inches	10.00
1 Exhaust Tank, diameter 36 inches, depth 24 inches	25.00
1 Process Tank, diameter 36 inches, depth 24 inches	25.00
4 Scalding Baskets	6.60
2 Exhaust Crates, 1 tier	7.00
2 Process Crates, 2 tier	13.00
1 Perforated Steam Coil for Scalding Tank	2.50
1 Perforated Steam Coil for Exhaust Tank	2.50
1 Perforated Steam Coil for Process Tank	2.50

1 Crane	$13.00
1 30-gallon Gasolene Tank 1 Air-Pump for Gasolene Tank 1 Air-Guage for Gasolene Tank 2 Gasolene Fire-pots	40.00
1 Floor Truck	10.00
4 Capping Steels	16.00
4 Tipping Coppers	2.00
1 Forging Stake	3.50
1 Vise	5.50
1 Thermometer	1.00
1 Platform Scale	30.00
2 Can Tongs	1.00
1 Syrup Gauge	1.00
1 Hammer	1.00
25 Buckets	5.00
6 Capping Trays, 2 by 2 feet	2.40
3 Peeling Tables, 3 1-2 by 8 feet	24.00
1 Packing Table, 3½ x 8 feet 1 Capping Table, 3 x 8 feet	16.00
Estimated cost of this outfit, delivered f. o. b.	$460.00

A building of two stories, 20 by 45 feet, would be a very suitable one for this outfit. Boiler may be placed either in this building or in a boiler room adjoining. The first floor can be used for process room, and the second for the storage of empties and stock. To successfully operate this factory would require sixteen hands, as follows: Nine peelers, four packers, one processor, one man as capper and tipper, and one fireman. Much depends on the help, and all slow help should be weeded out. The help may be women and children, except as to fireman, processor and solderer. Peelers of tomatoes are usually paid 3 cents per bucket of 4 gallons.

PLANT NO. 2.

Estimated amount and cost of machinery for outfit of 2,000 cans capacity per day of 10 hours. Open-bath process, but the kettles are of boiler-iron, set in brick and heated by furnace. Articles can be bought separately at prices given.

1 Cast-Iron Scalding Kettle, 60 gallons	$10.00
1 Boiler-Iron Exhaust Kettle (1-8 iron), diameter 36 inches, depth 24 inches	20.00
1 Boiler-Iron Process Kettle, diameter 36 inches, depth 36 inches	30.00
4 Scalding Baskets	6.60
2 Exhaust Crates, 1 tier	13.00
2 Process Crates, 2 tier	13.00
3 Sets of Grate Bars	7.50
3 Furnace Doors	8.00
1 Crane	13.00

1 Floor Truck	$10.00
1 20-gallon Gasoline Tank 1 Air-Pump for Gasolene Tank 1 Air-Guage for Gasolene Tank 1 Gasolene Fire-Pot	26.00
4 Capping Steels	16.00
4 Tipping Coppers	2.00
1 Forging Stake	3.50
1 Vise	5.50
1 Thermometer	1.00
1 Platform Scale	22.50
2 Can Tongs	1.00
1 Syrup Gauge	1.00
1 Hammer	1.00
25 Buckets	5.00
6 Capping Trays, 2 by 2 feet	2.40
3 Peeling Tables, 3 1-2 by 8 feet	24.00
1 Packing Table, 3 1-2 by 8 feet	8.00
1 Capping Table, 3 by 8 feet	8.00
Delivered f. o. b.	$246.00

REMARKS.—The above outfit is adapted to canning fruits, berries and tomatoes. It differs from Plant No. 1 only in this respect, that the kettles are of 1-8 boiler-iron and are set in brick work, with furnace for heating the water-bath. Numbers of these outfits are being operated, principally for canning tomatoes. It requires about 3,000 brick for furnace and chimney. The size building best adapted to this outfit is one of 20 by 45 feet, one or two stories. The help required is about same as for Plant No. 1.

PLANT No. 3.

Estimated amount of machinery for outfit of 5,000 cans capacity per day of 10 hours.

We here figure on open-bath steam-heat process:

1 23-Horse Power Boiler, *complete with all trimmings, and including* proper piping and fittings necessary for connecting boiler with tanks.
1 Scalding Tank, diameter 36 inches, depth 24 inches.
1 Exhaust Tank, diameter 36 inches, depth 24 inches.
2 Process Tanks, diameter 36 inches, depth 36 inches.
1 Perforated Steam Coil for Scalding Tank
1 Perforated Steam Coil for Exhaust Tank.
2 Perforated Steam Coils for Process Tank.
6 Scalding Baskets.
2 Exhaust Crates, 1 tier.
4 Process Crates, 2 tier.
1 Traveling Hoister.
1 30-Gallon Gasolene Tank.
1 Air-Pump.
1 Air-Guage.
4 Firepots.
1 Floor Truck.
4 Can Tongs.

6 Capping Steels.	1 Syrup Gauge.
6 Tipping Coppers.	50 Buckets.
1 Forging Stake.	8 Capping Trays, 2 by 2 feet.
1 Vise.	5 Peeling Tables, 3 1-2 by 8 feet.
1 Thermometer.	2 Packing Tables, 3 1-2 by 8 feet.
1 Platform Scale.	2 Capping Tables, 3 by 8 feet.

Cost of this outfit delivered f. o. b., about $650.

Above outfit is adapted to canning fruits, berries and tomatoes.

A building of two stories, 30 by 60 feet, will be a very suitable one for this plant. Boiler may be placed either in this room or in a boiler-room adjoining. The first floor can be used for a process room, and the second for storage of empties and stock. To successfully operate a factory of this capacity would require twenty hands—eight peelers, eight packers, one processor, two men crapping and tipping, and one fireman.

The apparatus and fixtures listed above are all that is required for a cannery putting up not more than 5,000 cans daily. For larger canneries an engine and various labor-saving power machines would be necessary.

Very few canners now make their own cans. Can-making is a specialty carried on in large factories with aid of improved machinery. As a rule, a cannery whose output does not exceed 5,000 cans daily can buy the cans cheaper than it can make them. Ready-made cans are sold at about $1.90 per 100 for 2-pound cans; $2.50 per 100 for 3-pound cans. By the 1,000 the cans cost a little less. They usually come packed in crates holding two dozen cans. The same crates are used to ship the packed goods in.

Solder costs 17 cents per pound; soldering fluid 32 cents per gallon. Labels are necessary. They are nearly always lithographed in colors, showing the kind of fruit contained and the name and address of canner. Labels cost from $1.25 to $2.00 per 1,000.

The standard size for cans is as follows:

No. 1, or one-pound	2 3-4 by 4 inches.
No. 2, or two-pound	3 7-16 by 4 9-16 inches.
No. 3, or three-pound	4 3-16 by 4 7-8 inches.
No. 10, or gallon	6 1-4 by 7 inches.

All outside measurement.

Canned goods in the market are graded as follows: Extras, standards, seconds and pie fruit.

The following notes on manipulation will assist beginners. But it must be fully understood that in canning, as in other practical arts, nothing will take the place of experience. Therefore, those who go into the canning business should start on a small scale and increase business as experience warrants:

APPLES.

Best varieties for canning: Astrachan, Oldenburg, Maiden's Blush, Winesap.

Apples are always pared, cored and quartered. Pack solidly in 3-pound or gallon cans; use water as liquor. After capping heat cans 5 minutes in ex-

haust kettle to drive out the air, then seal vent and process or boil cans in open baths for 10 minutes. Apples pay well to can.

PEACHES.

Best varieties to can are medium sized, firm, yellow peaches. Elberta, Emma and Crawford's late are popular varieties. Peaches are pared, halved, stoned and solidly packed in 2-pound or 3-pound cans. Use plain water for pie and second-grade fruit. But for extras and extra standard grades a 10-degrees Brix sugar syrup is used. Exhaust cans 5 minutes; process 10 minutes in open bath. The higher grades of peaches are profitable to can and always find a ready sale.

PEARS.

Best variety to can: Kieffer. Fruit must not be fully ripe. Pare, core and quarter the fruit. Plunge into boiling water for a few minutes and then into ice-cold water. This is called blanching. Pack solidly in 3-pound cans. Use a 10-degrees Brix sugar syrup as liquor. Exhaust cans 5 minutes; process in open kettle 12 minutes. Pears are very profitable to the canner.

BLACKBERRIES.

Best varieties to can: Wilson and Kittatiny. Fruit must not be over-ripe; spread on table and pick out all leaves and trash and all small and imperfect fruits. Pack fruit solidly without washing into 2-pound cans. Use water as liquor. Exhaust cans 3 minutes; boil or process in open bath for 7 minutes. All other berries are put in the same way as blackberries. But for strawberries a 10-degree sugar syrup is used. Berries pay fairly well to can.

GRAPES.

Best varieties to can: Delaware, Niagara and Brighton. Grapes are canned exactly as berries. The grape berries are first hand-picked off the stems and all immature and unsound fruit rejected. This fruit keeps well. Demand for canned grapes is not large. A more profitable way to utilize the grape crop is to make it into jelly. See directions further on in this paper.

TOMATOES.

The tomato is more extensively canned than any other vegetable. Best varieties to can are Stone and Paragon. Champion and Brandywine are also good. Tomatoes must be fully ripe. Scald in steam or boiling water until skins crack. Remove peelings by means of a thin-bladed, shoe-maker's knife. Pack the peeled tomatoes, without slicing, solidly into 3-pound or gallon cans; use water as liquor. Exhaust 10 minutes; process in open bath 30 minutes, for small cans; 50 minutes for large cans. Tomatoes may be processed in closed bath at 240 degrees F. for 10 minutes, but such goods are always deficient in flavor and color.

The following vegetables all require a higher temperature than 212 degrees F., therefore, the closed bath must be used. Process from 30 to 40 minutes.

ASPARAGUS.

Use weak, boiling brine for liquor.

SNAP BEANS.

Use weak, boiling brine for liquor.

GREEN CORN.

Use weak, boiling brine for liquor.

GREEN PEAS.

Use weak, boiling brine for liquor.

OKRA.

Can only young and tender pods. Use brine for liquor.

PUMPKIN.

Any variety may be canned. Scald whole fruit for 5 minutes and peel as in case of tomatoes. Slice and then grate or mash the flesh rejecting seeds. Pack solidly into 3-pound cans without liquor. Exhaust 5 minutes; process in closed bath 20 minutes. Pumpkins pay well to can.

SQUASH is packed like pumpkin. The Boston Marrow is the favorite variety. Squash is profitable to can. Canners usually pay $20 per ton.

SWEET POTATOES.

Best varieties to can: Yellow Nansemond, Jersey Sweet and Vineless. Wash and boil the potatoes until the skin cracks. Peel and slice or quarter. Pack solidly in 3-pound cans. Use no liquor. Exhaust 5 minutes; process 10 minutes in closed bath at 240 degrees F., or 40 minutes in open bath at 212 degrees F. The demand for canned sweet potatoes is good and growing. Only the dry, mealy varieties are wanted. Should be more extensively canned. Pays well and can be made very profitable in the Southern States.

JELLY-MAKING.

Pure fruit jellies have become scarce and high-priced on the market. The preparation of jellies can be profitably carried on in connection with canning fruits. Fruit too ripe for canning can be utilized for jelly-making. The fruits best suited for jelly-making are apple, pear, blackberry, grape, peach and plum. The currant also makes fine jelly.

To make jelly, only sound, fully ripe fruit may be used. Apples and pears are first grated and then crushed in a press, preferably of the hydraulic type. Berries and grapes are pressed without previous grinding. The juice as it runs from the press is filtered through a horse-hair sieve or a layer of finely-chopped and well-washed oat or rye straw. Sugar enough—ordinary granulated sugar is best—is added to bring the density of juice up to 20 degrees, on the saccharometer. The sweetened juice is then at once run into the boiling pan. The ordinary pan used in boiling sorghum or maple sap for syrup is equally suited for jelly-making. But a better grade of syrup and jelly can be made in a pan or boiler, which excludes the air and prevents the formation of caramel. The best form of pan is a long, covered and ventilated wooden trough having heavy copper steam pipes running lengthwise of the box. The steam in the pipes must be under a pressure of not less than 80 pounds. The South

Allen Evaporator, made at Mt. Gilead, O., is of this type, and gives good satisfaction. Whichever pan is used the heating surface must be hot enough to keep the juice boiling vigorously from start to finish. Only a shallow layer of juice must be carefully skimmed off. The scum thrown up by the boiling juice must be carefully skimmed off. Not more than eight minutes' boiling should be required. Longer boiling darkens the product and also reduces its sweetness. The degree of condensation required to jellify differs with different fruits. Usually in making apple jelly, five parts of pure juice make one of jelly.

To one hundred pounds of clear juice we add about twenty pounds of sugar. The product is 40 pounds of sweetened jelly. This can be sold at a handsome profit.

FRUIT JUICES.

There is a considerable demand for plain fruit juices. These are used for making the syrups used in soda water and for various other purposes. In making apple, pear and quince juice the fruit is crushed and pressed as described for apple jelly. Small fruits may be pressed without crushing. The juice as it runs from the mill is filtered through finely-chopped and well-washed rye straw. It is then clarified by adding the white of two eggs for each gallon of juice. The egg should be beaten up thoroughly with a small quantity of juice and this stirred into the whole. Then heat to about 200 degrees F. Allow to stand for two hours and siphon off the clear liquid into heavy opaque glass or earthen bottles, which must not be completely filled. Place the bottled juice in cold water bath and heat until the water in bath begins to boil. Then seal bottle air tight, withdraw the fire and allow bottles to remain in bath until water is cold. Store the juice in a cool dark place.

FRUIT WINES AND BRANDIES.

In Europe, especially in the Black Forest region of Germany, wild and cultivated cherries are fermented and distilled into very celebrated brandies called *Kirschenwasser* and *Maraschino*. In France and Hungary plums are used for the same purpose.

The fruit must be fully ripe. Only hand-picked fruit is used. The fruit is crushed between wooden rollers and then thrown into clean open casks which are placed under a shed. Fermentation sets in in three or four days and continues for about thirty days. The fermented juice is then drawn off and allowed to settle for two weeks. It is then racked off and distilled. The best native fruit for making these liquors are the wild black or choke cherries, black cultivated cherries and plums.

BRANDIED FRUITS.

Brandied fruits are put up and consumed in very large quantities. To obtain the best results the most particular care is needed. The fruits most commonly put up in brandy are apricots, cherries, peaches, plums and pears. The fruit must be fully grown, sound and plump, but not quite ripe. Each fruit must be carefully wiped with a linen cloth and pricked to the center in several places with a silver or wooden needle. Then throw into a water bath heated to 200 degrees F. Remove from fire and let stay for 10 minutes. Then

heat again until the fruit begins to rise to surface of water. Skim off and throw into ice-cold water. After fruit is completely cold, drain and place into a tub holding brandy containing about 55 per cent alcohol. Let stand six days. Now place the fruit in the jars in which it is to be sold or preserved. To each gallon of the brandy in which the fruit has been soaked add four ounces of granulated sugar and heat to 200 degrees F. Cover the fruit in the jars with the hot, sweetened brandy. Seal jars air tight and put away in a cool, dark place. It is customary to add spice, usually essences of cinnamon, cloves and coriander, to the brandy in which the fruit is soaked before the fruit is put in. Pears must be peeled before soaking in brandy.

MARMALADE AND APPLE BUTTER.

The lowest grade of sound fruit may be worked up into marmalade or fruit butter. The apparatus needed for this work is very simple. Where steam is employed an ordinary barrel or hogshead is used to boil the fruit in. But a heavy cast-iron kettle set in a furnace will do quite as well. Apples, quinces and pears must be sliced or chopped, but need not be peeled or cored. Place the chopped fruit in the cooker and cover with juice of the same fruit. Plain water will do, but this entails more work in evaporating the water. Boil until the fruit becomes soft enough to be easily run through a colander. Pass through colander to remove seeds, skins and cores. Add sugar to taste. The amount of sugar required depends upon the variety, natural sweetness and ripeness of the fruit used, and also upon the judgment of the operator and the demands of his trade. Usually in making apple marmalade, to every 100 pounds of apple paste from the colander 30 pounds of sugar is added. Cook again until the marmalade is reduced to desired consistency. Usually 100 pounds fruit and 8 gallons of fruit juice, to which is added 30 pounds granulated sugar, make 110 pounds finished marmalade.

Fruit butter differs from marmalade only in being spiced and using only 20 pounds of sugar to 100 pounds fruit. Both these products keep well in ordinary covered wooden pails, if kept in a cool, dark place. The best marmalade is made from wild crabs. Wild plums and choke cherries also make a good marmalade and are very wholesome. Some people prefer quince marmalade to all others.

JAMS.

The jams most commonly found in the market are made from plums and blackberries in varying proportions. The following formula is used by a large commercial establishment:

Fresh ripe blackberries	100 pounds.
Apple or plum pulp	20 pounds.
Granulated sugar	106 pounds.

Directions: Boil and pass the apples or plums through a colander. To the pulp thus prepared add the blackberries. Stir in the sugar and boil the whole for 15 minutes. Fill while hot into jars. Seal air tight. The black or damson plum makes the best jam, but any plum will do.

EVAPORATING FRUITS.

The fruits most commonly evaporated are apple, peach, prune, blackberry, raspberry and whortleberry. There is also a small demand for evaporated vegetables, such as corn, sweet potato and pumpkin. Of all evaporated fruits the apple is most popular and most extensively used.

Only good, sound fruit can be used. The apples are pared, cored and sliced or quartered by machines made for that purpose. The sliced or quartered fruit should be quickly dropped for five minutes into a weak brine made by dissolving one pound of salt in two gallons of cold water. The brine prevents the fruit from discoloring. From the brine bath remove the fruit and place in shallow layers on a wire-bottomed tray. Most evaporator men subject the fruit at this stage to fumes of burning sulphur to bleach it. But if the brine bath is used no sulphuring is necessary. Sulphur bleaches the fruit, but greatly decreases its food value and flavor. The brined fruit retains its natural color and a rich, fruity flavor. The salt does not taste on the fruit. There are many styles of evaporators on the market from the small affair to be set on the back of a cook stove to the giant brick stack. All do good work. The heat is nearly always supplied by a furnace below the evaporating tower. In the best forms of commercial evaporators there is an elevating arrangement worked by a crank so that each fresh tray of fruit goes in at the bottom and by turning the crank the whole superimposed stack of trays is moved up one notch to make room for the next tray. By the time the first tray reaches the top of the stack the fruit is dry. The machine is thus continuous and usually works night and day throughout the drying season. The Trescott Evaporator Company, of Fairport, N. Y., makes a good evaporator for commercial work. No evaporator having a capacity of less than twenty-five bushels of green fruit per day of 24 hours can be made to pay commercially. The larger the evaporator, the less the costs per pound of finished product. A complete outfit, including paring and slicing machines for evaporating 100 bushels of apples daily, can be installed for about $500.

The following figures as to profits on evaporated fruit are approximately correct for North Carolina. One bushel of fresh apples will produce 6½ pounds dried fruit, worth about 50 cents, at cost of 10 cents for labor and fuel.

One bushel of peaches will produce 6 pounds dried fruit, worth about 50 cents, at cost of 15 cents for labor, etc.

One hundred quarts blackberries will produce 40 pounds dried fruit, worth $4.00, at cost of 50 cents for labor, etc.

One hundred quarts black raspberries will produce 30 pounds dried fruit, worth $6.00, at cost of 40 cents for labor, etc.

One hundred quarts whortleberries will produce 40 pounds dried fruit, worth $6.00, at cost of 25 cents for labor, etc.

These profits are not great when the evaporator man has to buy his fruit at average market rates. But there are many localities where surplus fruit has no market value.

Canneries are more profitable than evaporators where proper skill and labor is attainable. The evaporated product is more concentrated and is easier to handle and transport. Every fruit-growing community should have

a cannery or evaporator with capacity sufficient to work up all its surplus fruit. This will, by taking the surplus, prevent ruinous gluts and consequential breaking down of the market. The breaking down of the market on any early fruit not only spoils the sale of the remainder of the variety which has "slumped," but greatly injures the sale of all later fruits. The city consumer who has bought his strawberries at less than the cost of growing, will not want to pay a fair price for his blackberries or grapes when these come in season! As a rule, more fruit is wasted each year in every considerable fruit-growing neighborhood than would equip a good cannery or evaporator.

I. COMPLETE FERTILIZER ANALYSES—SPRING SEASON, 1901.*

BY B. W. KILGORE, STATE CHEMIST.

The analyses presented in this *Bulletin* are of samples collected by the fertilizer inspectors of the Department, under the direction of the Commissioner of Agriculture, since the middle of January, of this year, and, therefore, represent the character of fertilizers the farmers have used this season. They should receive the careful study of every farmer in the State who uses fertilizer, as by comparing the analyses in *The Bulletin* with the claims made for the fertilizers actually used, the farmer can know whether or not they contain the fertilizing constituents in the amounts they were claimed to be present. This *Bulletin* contains all the analyses made of spring goods, previous reports of analyses completed up to the times having been sent out in *The Bulletin* in January, February, March and April.

TERMS USED IN ANALYSES.

Some additional terms are used in this *Bulletin* in connection with the fertilizer analyses that did not appear in last season's publications. This is necessitated by a more detailed analyses of fertilizers.

WATER-SOLUBLE PHOSPHORIC ACID.

Phosphate rock, as dug from the mines mainly in South Carolina, Florida and Tennessee, is the chief source of phosphoric acid in fertilizers.

In its raw, or natural, state the phosphate has three parts of lime united to the phosphoric acid (called by chemists tri-calcium phosphate). This is very insoluble in water and is not in a condition to be taken up readily by plants. In order to render it soluble in water and fit for plant food, the rock is finely ground and treated with sulphuric acid, which acts upon it in such a way as to take from the three-lime phosphate two parts of its lime, thus leaving only one part of lime united to the phosphoric acid. This one-lime phosphate is what is known as water-soluble phosphoric acid.

*The analyses were made by Messrs. W. M. Allen, S. E. Asbury, W. G. Haywood, C. D. Harris, and J. M. Pickel.

REVERTED PHOSPHORIC ACID.

On long standing some of this water-soluble phosphoric acid has a tendency to take lime from other substances in contact with it, and to become somewhat less soluble. This latter is known as reverted or gone-back phosphoric acid. This is thought to contain two parts of lime in combination with the phosphoric acid and is thus an intermediate product between water-soluble and the original rock.

Water-soluble phosphoric acid is considered somewhat more valuable than reverted, because it becomes better distributed in the soil as a consequence of its solubility in water.

AVAILABLE PHOSPHORIC ACID

Is made up of the water soluble and reverted; it is the sum of these two.

WATER-SOLUBLE AMMONIA.

The main materials furnishing ammonia in fertilizers are nitrate of soda, sulphate of ammonia, cotton-seed meal, dried blood, tankage, and fish scrap. The first two of these (nitrate of soda and sulphate of ammonia) are easily soluble in water and become well distributed in the soil where plant roots can get at them. They are, especially the nitrate of soda, ready to be taken up by plants, and are, therefore, quick acting forms of ammonia. It is mainly the ammonia from nitrate of soda and sulphate of ammonia that will be designated under the heading of water-soluble ammonia.

ORGANIC AMMONIA.

The ammonia in cotton-seed meal, dried blood, tankage, fish scrap, and so on, is included under this heading. These materials are soluble in water and before they can feed plants they must decay and have their ammonia changed, by the aid of the bacteria of soil, to nitrates, similar to nitrate of soda.

They are valuable then as plant food in proportion to their content of ammonia, and the rapidity with which they decay in the soil, or rather the rate of decay, will determine the quickness of their action as fertilizers. With short season, quick-growing crops, quickness of action is an important consideration, but with crops occupying the land during the greater portion, or all, of the growing season, it is better to have a fertilizer that will become available more slowly so as to feed the plant till maturity. Cotton-seed meal and dried blood decompose fairly rapidly, but will last the greater portion, if not all, of the growing season in this State. While cotton seed and tankage will last longer than meal and blood, none of these act so quickly, or give out so soon, as nitrate of soda and sulphate of ammonia.

TOTAL AMMONIA

Is made up of the water soluble and organic. It is the sum of these two.

The farmer should suit, as far as possible, the kind of ammonia to his different crops and a study of the forms of ammonia as given in the tables of analyses will help him to do this.

VALUATIONS.

To have a basis for comparing the values of different fertilizer materials and fertilizers, it is necessary to assign prices to the three valuable constituents of fertilizers—ammonia, phosphoric acid, and potash. The figures, expressing relative value per ton, are not intended to represent crop-producing power, or agricultural value, but are estimates of the commercial value of ammonia, phosphoric acid, and potash in the materials supplying them. These values are only approximate, as the cost of fertilizer materials are liable to change as other commercial products are, but they are believed to fairly represent the cost of making and putting fertilizers on the market. They are based on a careful examination of trade conditions, wholesale and retail, and upon quotations of manufacturers.

Relative value per ton, or the figures showing this, represents the prices on board the cars at the factory, in retail lots of five tons or less, for cash.

To make a complete fertilizer the factories have to mix together in proper proportions materials containing ammonia, phosphoric acid, and potash. This costs something. For this reason it is thought well to have two sets of valuations—one for the raw or unmixed materials, such as acid phosphate, kainit, cotton-seed meal, etc., and one for mixed fertilizers.

The values used last season were:

VALUATIONS FOR 1900.

IN UNMIXED OR RAW MATERIALS.

For ammonia	13	cents per pound.
For phosphoric acid	4½	cents per pound.
For potash	5	cents per pound.

IN MIXED FERTILIZERS.

For ammonia	15	cents per pound.
For phosphoric acid	5	cents per pound.
For potash	5½	cents per pound.

The valuations decided on for this season, for the reasons already given, are:

VALUATIONS FOR 1901.

IN UNMIXED OR RAW MATERIALS.

For ammonia	14	cents per pound.
For phosphoric acid in acid phosphate	4	cents per pound.
For phosphoric acid in fine bone	3	cents per pound.
For phosphoric acid in medium and coarse bone	2½	cents per pound.
For potash	5	cents per pound.

IN MIXED FERTILIZERS.

For ammonia	16	cents per pound.
For phosphoric acid	4½	cents per pound.
For potash	5½	cents per pound.

HOW RELATIVE VALUE IS CALCULATED.

In the calculation of relative value it is only necessary to remember that so many per cent means the same number of pounds per hundred, and that there are twenty hundred pounds in one ton (2,000 pounds).

With an 8—2—2 goods, which means that the fertilizer contains available phosphoric acid 8 per cent, potash 2 per cent, and ammonia 2 per cent, the calculation is made as follows:

Percentage or lbs. in 100 lbs.	Value per 100 lbs.	Value per Ton 2,000 lbs.
8 pounds available phosphoric acid, at 4½ cents....	0.36×20=	7.20
2 pounds potash, at 5½ cents....................	0.11×20=	2.20
2 pounds ammonia, at 16 cents..................	0.32×20=	6.40
Total value	0.79×20=	15.80

Freight and merchant's commission must be added to these prices. Freight rates from the seaboard to interior points are given in the following table:

[NOTE.—To avoid duplications, the List of Fertilizers registered during the year 1901 are omitted, but the list for 1902 appears further on.]

Freight Rates from the Seaboard to Interior Points.—*From the Published Rates of the Associated Railways of Virginia and the Carolinas—In Carloads, of not less than ten tons each, per ton of 2,000 pounds. Less than Carload, add 20 per cent.*

Destination.	From Wilmington, N. C.	From Norfolk and Portsmouth, Va.	From Charleston, S. C.	From Richmond, Va.
Advance	$3.20	$3.20	$3.40	$3.20
Apex	2.70		3.80	3 00
Ashboro	3.20	3.20	3.60	3.20
Asheville	4.00	4.00	4.00	4.00
Chapel Hill	3.20	3.20	3.90	3.20
Charlotte	3.00	3.30	3.20	3.20
Clayton	2.48	2.83	2.63	2.83
Cherryville	3.20	3.60	3.40	3.60
Clinton	1.60	3.00	3.20	3.00
Creedmore	3.00	3.00	3.80	3.00
Cunningham	3.50	2.40	4.00	2 40
Dallis	3.40	3.60	3.40	3.60
Davidson College	3.20	3.20	3.20	3 20
Dudley	1.70	3 00	3.20	3.00
Dunn	2.00	2.80	3.20	2.80
Durham	2.80	2.83	3.60	2.83
Elkin	3.20	3.20	3.60	3.20
Elm City	2.10	2.60	3 20	2.60
Fair Bluff	1.60	3.80	2.40	3.80
Fayetteville	1.80	3.00	3.00	3 00
Forestville	3.00	3.00	3.80	3 00
Gastonia	3.36	3.56	3.36	3.56
Gibsons	2.40	3.50	3.50	3.50
Goldsboro	1.80	2.80	3.20	2.80
Greensboro	3.00	3.00	3.40	3.00
Hamlet		3.00	3.60	3.00
Henderson	3.00	3 00	3 80	3.00
Hickory	3.60	3.60	3.85	3.60
High Point	3.08	3.08	3.40	3.08
Hillsboro	2.88	2.88	2.68	2.88
Kernersville	3.00	3.00	3.40	3 00
Kinston	2.10	2.50	3 50	2.50
Laurel Hill	2.30	2.40	3.80	3.40
Laurinburg	2.30	3.40	3.80	3.40
Liberty	2.50	3.60	3.80	3.60
Louisburg	3.00	3.00	3.80	3.00
Lumberton	1.95	3.60	3.70	3.60
Macon	3.00	3.00	3.85	3.00
Madison	3.00	3.00	3.00	3.00
Matthews	3.00	3.20	3.20	3.20
Maxton	2.10	3.40	3.00	3.40
Mebane	2.96	2.96	3.76	2.96
Milton	3.50	2.40	4.00	2.40
Mocksville	3.20	3.20	3 40	3.20
Morven	2.50	3.60	2.50	3.60
Mount Airy	3.20	3.40	3.80	3.40
Nashville	2.30	2.90	3.40	2.90
New Bern	1.25	1.75	3.95	1.79
Norwood	3.20	3 20	3.20	2.23
Oxford	3.04	2.83	3.80	2.85
Pineville	3.00	3.25	3.00	3.20
Pittsboro	3.00	3.30	4.10	3.30
Polkton	2.60	3.00	2.20	3.00
Raleigh	2.56	2.83	3.63	2.83
Reidsville	3.00	2.96	3.40	2.36
Rockingham	2.40	3.00	3.80	3.00
Rocky Mount	2.20	2.50	3.40	2.50
Ruffin	3.00	2.80	3.40	2.20
Rural Hall	3.20	3.20	3.60	3.20
Rutherfordton	3.40	3.65	3.40	3.65
Salisbury	3.20	3.20	3.20	3.20
Sanford	2.10	3.00	3.40	3.00
Selma	2.10	2.80	3.20	2.80
Shelby	3.20	3.60	3.40	3.60
Siler City	2.40	3.60	3.80	3.60
Smithfield	2.10	2.80	3.20	2.80
Statesville	3 20	3.20	3.60	3.20
Stem	2.96	2.83	3.80	2.83
Tarboro	2.40	2.00	3.00	2.40
Waco	3.20	3.60	3.40	3.60
Wadesboro	2.50	3.00	2.50	3.00
Walnut Cove	3.00	3.00	3.40	3.00
Warrenton	3.25	3 25	4.10	3.25
Warsaw	1.50	3.00	3.20	3.00
Washington	1.75	1.75	2.25	1.50
Weldon	2.45	1.90	3.85	1.90
Wilson	2.00	2.60	3.20	2.60
Winston-Salem	3.00	3.00	3.40	3.05

ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1901.

Laboratory No.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100. Water-Soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-Soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Potash.	Relative Value Per Ton at Factory.
	MIXED FERTILIZERS.											
	Brands claiming						8.00			2.00	1.00	$14.70
1313	American Agricultural Chemical Co., Baltimore, Md.	Zells' Ammoniated Bone Superphosphate.	Elm City	R	5.12	3.97	9.09	.78	1.42	2.20	2.26	17.71
1436	do	do	Edenton	S	6.55	2.11	8.66	1.15	1.17	2.32	2.26	17.70
1621	Atlantic Chemical Co., Norfolk, Va.	Atlantic Special Guano	Statesville	S	4.95	3.88	8.83	1.06	1.04	2.10	1.07	15.84
1238	do	do	Lumberton	R	4.95	2.60	7.55	.78	1.54	2.32	1.01	15.33
1622	Baugh & Sons Co., Norfolk, Va	Baugh's Double Eagle Phosphate.	Statesville	R	5.13	4.62	9.75	1.00	1.08	2.08	1.25	16.80
1102	do	Baugh's Old Standby Raw Bone Superphosphate.	Washington	R	5.35	3.93	9.28	.71	1.40	2.11	1.36	16.60
1212	do	do	Lumberton	S	4.65	4.61	9.29	.87	1.35	2.22	1.24	16.63
1269	Branch, A. P., Wilson, N. C	North State Guano	Wilson	D	6.32	2.22	8.51		2.32	2.32	1.73	17.01
1643	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Comet Guano	Angier	R	4.80	2.50	7.30	.30	2.15	2.45	1.98	16.59
1340	Charlotte Oil and Fertilizer Co., Charlotte, N. C.	Catawba Guano	Charlotte	R	5.37	3.00	8.37	.06	2.32	2.38	1.33	16.61
1158	do	Queen of the Harvest	Louisburg	R	6.42	3.52	9.94	.17	2.11	2.28	1.24	17.61
1472	do	do	Bostic	R	5.95	2.41	8.36	.48	2.53	3.01	1.27	18.55
1480	do	do	Norwood	R	5.35	3.18	8.53	.50	2.27	2.77	1.23	17.89
1335	Navassa Guano Co., Wilmington, N. C.	Navassa Complete Fertilizer	Peachland	S	5.80	2.55	8.35	.60	1.85	2.45	1.63	17.15
1412	do	do	King's Mount'n	S	6.42	2.13	8.55	1.16	1.26	2.42	1.22	16.78
1497	do	do	Kinston	S	6.68	1.69	8.37	.99	1.07	2.06	1.90	16.21
1080	do	do	Leaksville	R			6.95			2.40	1.13	15.39
1518	Piedmont-Mount Airy Guano Co., Baltimore, Md.	Piedmont Guano for Cotton	Durham	S	4.50	3.99	8.49	1.02	1.00	2.02	1.32	15.57
1571	do	do	Franklinton	S	4.68	4.15	8.83	1.25	.75	2.00	1.33	15.81
1205	Rasin-Monumental Co., Baltimore, Md.	Rasin's Dixie Guano	Lumberton	R	7.37	2.01	9.38	1.09	1.35	2.44	1.57	17.98
1105	do	do	Youngsville	S	5.52	2.57	8.09	1.05	1.21	2.26	1.70	16.38
1481	Reidsville Fertilizer Co., Reidsville, N. C.	Banner Fertilizer	Ashboro	R	6.03	3.26	9.29	.41	1.99	2.40	1.47	17.66
1578	do	do	Stokesdale	R	6.20	3.11	9.31	.35	1.70	2.05	1.61	16.71

1349	Richmond Guano Co., Richmond, Va.	Bone Mixture	Scotland Neck	R	5.72	3.56	9.28	.27	2.16	2.43	1.59	17.88
1272	Royster, F. S., Guano Co., Norfolk, Va.	Special Compound for Cotton, Corn, etc.	Wilson	R	5.85	2.75	8.60	.59	1.51	2.10	1.32	15.91
1278	do	do	Rockingham	R	5.60	2.64	8.24	.84	1.27	2.11	1.20	15.49
1550	do	do	Kernersville	R	4.90	3.20	8.10	1.05	1.21	2.26	1.38	16.04
1316	Southern Chemical Co., Winston, N. C.	Yadkin Complete Fertilizer	Raleigh	R	6.70	3.02	9.42	.55	2.00	2.55	1.58	18.65
1482	do	do	Ashboro	R	6.88	2.02	8.90	.83	2.02	2.85	1.60	18.89
1271	Tomlinson, Moore & Co., Wilson, N. C.	Dixie Cotton Grower	Wilson	S	6.37	3.63	10.00	.37	1.78	2.15	1.37	17.39
1202	Va.-Car. Chem. Co., Richmond, Va.	Allison & Addison's Star Brand Guano.	Lumberton	R	7.52	1.71	9.23	.96	1.18	2.14	1.48	16.78
1384	do	do	Chapel Hill	R	6.08	3.40	9.48	.94	1.63	2.57	1.07	17.93
1411	do	do	Concord	S	5.78	3.36	9.14	1.03	1.47	2.50	1.40	17.77
1459	do	do	Fremont	S	6.00	2.22	8.22	.85	1.31	2.16	1.65	16.12
1143	do	Beef, Blood & Bone Fertilizer	Whiteville	S	6.25	2.23	8.48	.55	1.64	2.19	1.56	16.36
1211	do	do	Edenton	R	6.32	2.81	9.13	.73	1.29	2.02	1.39	16.37
1329	do	do	Monroe	S	6.72	1.86	8.58	1.02	1.26	2.28	1.42	16.58
1326	do	Crescent Brand Ammoniated Fertilizer.	Marshville	S	6.12	1.89	8.01	1.29	1.25	2.54	1.54	17.03
1412	do	do	Greensboro	R	5.68	2.42	8.10	.55	1.77	2.32	1.42	16.28
1165	do	Double Owl Brand Guano	Greenville	S	5.70	2.73	8.43	.73	1.44	2.17	1.24	15.89
1213	do	do	Shiloh	R	5.95	2.62	8.57	.77	1.44	2.21	1.60	16.54
1409	do	Durham Ammoniated Fert.	China Grove	S	4.65	3.39	9.04	.34	1.60	1.94	1.27	15.74
1577	do	do	Stokesdale	S	5.00	3.29	8.29	.50	1.41	1.91	1.39	15.10
1259	do	Orient Complete Manure	Wilson	S	6.22	2.48	8.70	.71	1.51	2.22	1.52	16.61
1510	do	do	Hickory	R	6.04	2.47	8.51	.32	1.80	2.12	1.32	15.89
1136	do	Pretlow's Champion for Peanuts, Cotton and Corn.	Plymouth	R	5.65	2.44	8.09	.67	1.35	2.02	1.30	16.49
1250	do	Progressive Farmer Guano	Powellsville	S	6.40	2.57	8.97	.69	1.03	1.72	1.06	14.74
1500	do	Standard Raw Bone Soluble Guano.	Lawndale	S	6.93	1.07	8.00	.63	1.48	2.11	1.14	15.21
1623	do	do	Shelby	S	7.80	1.82	9.62	.74	1.32	2.06	1.64	17.05
1192	do	Tinsley's Richmond Brand Guano.	Clinton	S	6.40	2.21	8.61	.82	1.61	2.43	1.58	17.26
1214	do	do	Indian Town	R	6.20	2.73	8.93	--- ---	2.32	2.32	1.41	17.01
1155	do	Vinco Guano for Tobacco	Burlington	R	6.60	2.10	8.70	.42	1.68	2.10	1.18	15.85
1552	do	do	Walnut Cove	D	6.38	3.99	10.37	1.11	.76	1.87	1.29	16.73
	Brands claiming						8.00			2.00	1.50	15.25
1279	American Fert. Co., Norfolk, Va.	Peruvian Mixture	Rockingham	S	6.60	1.75	8.35	1.13	1.06	2.19	1.80	16.50
1181	do	do	Elizabeth City	R	3.85	4.15	8.00		2.06	2.06	1.54	15.40
1407	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Crown Brand Ammoniated Guano.	Wake Forest	S	5.73	2.88	8.61	.31	1.80	2.11	1.42	16.06
1519	do	do	Salem	S	5.73	2.83	8.56	.10	2.43	2.53	1.75	17.76
1248	Imperial Company, Norfolk, Va.	Imperial Cotton Grower	Ahoskie	S	5.92	2.11	8.03	.68	1.52	2.20	1.92	16.38
1586	do	Standard Premium Guano	Edenton	R	5.63	2.68	8.31	.87	1.40	2.27	1.66	16.57

N, D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1901—Continued.

Laboratory No.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.							Relative Value Per Ton at Factory.
					Water-Soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-Soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Potash.	
	MIXED FERTILIZERS.											
	Brands claiming						8.00			2.50	1.00	$16.30
1302	Acme Mfg. Co., Wilmington, N. C.	Acme Soluble Bone	Laurinburg	S	6.52	2.57	9.09	1.40	1.49	2.89	1.38	18.95
1626	Atlantic Chem. Co., Norfolk, Va.	Atlantic Cotton Grower	Swan Station	R	5.18	3.27	8.45	1.11	1.44	2.55	1.00	16.86
1289	Charlotte Oil and Fertilizer Co., Charlotte, N. C.	Charlotte Soluble Guano	Wadesboro	R	5.60	2.99	8.59	.53	2.60	3.13	1.52	19.42
1484	do	do	Wadesboro	R	6.13	2.55	8.68	.41	2.84	3.25	1.01	19.32
1146	Navassa Guano Co., Wilmington, N. C.	Navassa Universal Fertilizer	Dixon	S	7.58	2.96	10.54	.97	1.41	2.38	3.04	20.45
1288	do	do	Wadesboro	R	5.55	2.08	7.63	1.65	.75	2.40	1.35	16.03
1531	Va.-Car. Chem. Co., Richmond, Va	Gibbs & Co.'s High Grade Ammonia.	Monroe	S	6.65	3.27	9.92	1.55	1.19	2.74	1.33	19.16
1234	do	do	Nashville	R	7.08	1.66	8.74	1.12	1.30	2.42	1.25	16.98
1240	do	Capital Cotton Fertilizer	Maxton	R	6.57	1.93	8.50	1.32	1.31	2.63	1.16	17.54
	Brands claiming						8.00			2.00	2.00	15.80
1207	American Agricultural Chemical Co., Baltimore, Md.	Canton Chemical Game Guano.	Edenton	R	8.07	2.32	10.39	.51	1.93	2.44	2.25	19.63
1179	American Fert. Co., Norfolk, Va.	Bone and Peruvian Guano	Edenton	R	5.38	3.06	8.44	.44	1.85	2.29	2.53	17.71
1287	do	do	Morven	S	6.75	1.85	8.60	1.09	.91	2.00	1.92	16.25
1566	Armour Fert. Works, Chicago, Ill.	Armour's Champion Fertilizer	Washington	S	4.53	3.48	8.01	.98	1.38	2.36	2.68	17.71
1304	do	Armour's General 2-8 2 Fert	John's Station	R	4.32	4.83	9.15	.24	1.87	2.11	2.35	17.57
1364	do	do	Bayboro	R	2.95	6.16	9.11	.61	2.16	2.27	1.96	19.22
1590	do	Armour's King Cotton 2-8-2 Fertilizer.	Liberty	R	4.15	3.70	7.85	.40	2.08	2.48	2.64	17.90
1560	Arps, Geo. L. & Co., Norfolk, Va	Premium Guano	Edenton	R	4.95	5.11	10.06	.34	1.55	1.89	2.23	17.55
1528	Ashepoo Fert. Co., Charleston, S.C.	Carolina Guano	Monroe	R	6.68	1.80	8.48	.36	1.68	2.04	2.11	16.48
1408	Atlantic Chem. Co., Norfolk, Va.	Atlantic Soluble Guano	China Grove	S	5.10	3.40	8.50	1.25	1.17	2.42	2.18	17.79
1420	do	do	Elizabeth City	S	6.10	3.09	8.19	.40	1.65	2.05	2.05	17.08
1265	Atlantic & Virginia Fertilizer Co., Richmond, Va.	Eureka Ammoniated Bone	Wilson	D	5.72	3.24	8.96	1.89	1.31	3.20	2.17	20.69
1311	Baily, J. L. & Co., Elm City, N. C.	Stag Brand Guano	Elm City	S	5.90	2.74	8.64	.38	1.85	2.23	2.24	17.38
1103	Baugh & Sons Co., Norfolk, Va.	Baugh's Animal Bone and Potash Compound.	Washington	R	5.40	3.54	8.94	.62	1.65	2.27	2.24	17.37
1583	do	do	Chadbourn	R	5.38	4.54	9.92	.94	1.14	2.08	2.01	17.79

1613	Blackstone Guano Co., Blackstone, Va.	Alliance Guano for Tobacco	Roxboro	R	3.68	5.86	9.54	1.34	1.06	2.40	1.13	17.51
1109	Bragaw, Wm. & Co., Washington, N. C.	Old Reliable Premium High Grade.	Washington	R	7.07	2.55	9.62	.57	1.49	2.06	2.28	17.76
1231	Caraleigh Phosphate and Fert-Works, Raleigh, N. C.	Eli Ammoniated Fertilizer	Springhope	R	6.47	2.47	8.94	.11	1.99	2.10	1.87	16.82
1371	do	do	Raleigh	R	6.48	2.94	9.42	.34	2.21	2.55	1,91	18.74
1410	do	do	China Grove	R	5.75	2.54	8.29	.53	1.89	2.42	1.92	17.32
1157	Charlotte Oil and Fert. Co., Charlotte, N. C.	King Cotton Grower	Louisburg	S	5.85	2.90	8.75		2.16	2.16	2.43	17.46
1541	do	do	Pittsboro	R	7.10	2.38	9.48	.49	1.94	2.43	1.77	18.25
1339	do	The Leader	Charlotte	R	4 78	3.87	8.65	.18	2.42	2.60	2.26	18.59
1572	do	do	Franklinton	R	3.98	2 80	6.78	.69	2.76	2.85	2.17	17.61
1094	Columbia Guano Co., Norfolk, Va	Columbia Soluble Guano	Washington	S	6.10	3.16	9.26	.79	1.47	2.26	2.01	17.78
1121	do	do	Kinston	S	5.10	3.39	8.49	.56	1.60	2.16	2.12	16.88
1317	do	do	Raleigh	S	6.30	2.43	8.73	.81	1.24	2.05	2.01	16.63
1540	do	H. & D. Ammoniated Guano	Raleigh	R	5.78	2.74	8.52	.96	1.07	2.03	1.96	16.32
1365	Cowell, Swan & McCotter Co., Bayboro, N C.	Cowell, Swan & McCotter Co.'s Bone and Fish Guano.	Bayboro	R	4.90	3.21	8.11		2.03	2 03	2.62	16.68
1362	do	Cowell, Swan & McCotter Co.'s Crop Guano.	Bayboro	R	5.25	2.88	8.13	.43	2.70	3.13	3.83	24.54
1323	Farmers Guano Co., Raleigh, N. C	State Standard Guano	Marshville	R	6.25	3.55	9.80	.27	1.99	2.26	2.17	18.44
1376	do	do	Raleigh	R	6.38	2.84	9.22	.39	2.26	2.65	1.92	18.89
1433	Holmes & Dawson, Norfolk, Va	Triumph Soluble Guano	Aulander	R	6.43	1.62	8.05	1.24	1.21	2.45	2.25	17.56
1421	Imperial Co., Norfolk, Va	Imperial Co.'s Champion Guano.	Edenton	S	5.72	2.57	8.20	1.14	1.47	2.61	2.25	18.29
1555	do	do	Scotland Neck	S	5.20	3.48	8.68	1.00	1.14	2.14	2.31	17.20
1437	Lazaretto Guano Co., Baltimore, Md.	Purity Guano	Edenton	R	6.40	1.98	8.38	1.50	1.27	2.77	2.21	18.84
1106	do	Tar Heel Special Guano for all Crops.	Washington	R	4.95	4.11	9.06	.98	1.48	2.46	2.27	18.52
1530	Lister's Agricultural Chemical Works., Newark, N. J.	Lister's Success Fertilizer	Monroe	S	6.25	2.23	8.48	.68	1.36	2.04	2.24	16.62
1334	MacMurphy, W. C. Co., Charleston, S. C.	Excellent Cotton and Corn Guano.	Wadesboro	R	7.05	1.86	8.91	.31	1.88	2.19	2.06	17.29
1495	Meadows, E. H. & J. A. Co., New Bern, N. C.	Meadows' Cotton Guano	Kinston	R	5.80	2.61	8.41	.94	1.80	2.74	2.23	18.79
1123	do	do	Kinston	R	2.95	4.90	7.85	.20	1.92	2.12	2.40	16.49
1144	Navassa Guano Co., Wilmington, N. C.	Navassa Cotton Fertilizer	Whiteville	S	6.10	2.48	8.58	.94	1.29	2.23	2.19	17.27
1624	do	do	Shelby	R	5.40	2.93	8.33	.72	1.64	2.36	2.00	17.25
1331	do	do	Monroe	S	6.00	2.60	8 60	1.38	.70	2.08	2.08	16.68
1576	do	Navassa Grain Fertilizer	Walnut Cove	S	6.88	1.65	8.53	1.53	.58	2.11	2.13	16.77
1507	do	do	Hickory	S	5.88	2.70	8.58	.84	1.08	1.92	1.92	15.98
1167	do	Occoneechee Tobacco Guano	LaGrange	S	6.85	2.18	9.03	.95	1.00	1.95	2.26	16.85
1551	do	do	Rural Hall	R	6.08	3 26	9.34	.78	1.31	2.09	2.13	17.44
1298	Ober, G. & Sons Co , Baltimore, Md.	Ober's Special Cot. Compound.	Edenton	S	8.42	.80	9.22	.92	1.17	2.09	2.95	18.23
1614	do	Ober's Standard Tobacco Fert.	Milton	D	8.55	1.41	9.96	1.30	.80	2.10	2.20	18.10

N, D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1901—Continued.

Laboratory No.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100. Water-Soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-Soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Potash.	Relative Value Per Ton at Factory.
	MIXED FERTILIZERS.											
1463	Patapsco Guano Co., Baltimore, Md.	Sea Gull Ammoniated Guano	Elm City	R	7.35	1.81	9.16	.68	1.63	2.31	2.37	18.24
1111	do	do	Washington	R	4.40	4.65	9.05	.46	1.51	1.97	2.13	16.79
1314	Piedmont-Mt. Airy Guano Co., Baltimore, Md.	Crumpler's Standard Premium	Washington	R	6.00	3.47	9.47	.48	1.55	2.03	2.54	17.81
1506	do	Piedmont Special for Cotton, Corn and Peanuts.	Hickory	R	5.30	3.34	8.64	1.02	1.02	2.04	2.51	17.06
1671	Pocahontas Guano Co., Lynchburg, Va.	Covington Tobacco Guano—Banner Brand.	Pilot Mountain	S	5.05	3.03	8.08	.85	1.38	2.23	2.14	16.76
1110	Pocomoke Guano Co., Norfolk, Va	Pamlico Superphosphate	Washington	R	5.22	3.81	9.03	.93	1.25	2.18	2.16	17.48
1493	do	do	Troy	R	5.10	4.06	9.16	.95	1.21	2.16	2.09	17.45
1273	Powhatan Chem. Co., Richmond, Va.	Magic Cotton Grower	Kinston	S	5.77	2.49	8.26	.23	1.83	2.06	2.30	16.56
1423	do	do	Monroe	R	4.72	3.91	8.63	.42	1.72	2.14	2.32	17.17
1194	do	Magic Special Fertilizer	Oxford	S	5.90	3.20	9.10	.27	1.92	2.19	2.30	17.78
1382	do	do	Oxford	S	5.62	3.94	9.56	.23	2.25	2.48	2.37	19.15
1328	Rasin-Monumental Co., Baltimore, Md.	Rasin's Empire Guano	Monroe	S	7.12	1.49	8.61	1.16	.95	2.11	2.23	16.95
1383	do	do	Oxford	S	5.90	2.71	8.61	1.35	.75	2.10	2.26	16.95
1599	Reidsville Fertilizer Co., Reidsville, N.C.	Champion Fertilizer	Reidsville	R	6.25	2.74	8.99	.12	1.97	2.09	2.00	16.98
1134	Richmond Guano Co., Richmond, Va.	Premium Brand Fertilizer	Robersonville	R	6.50	2.97	9.47	.28	1.75	2.03	2.26	17.50
1321	do	do	Marshville	S	5.75	2.73	8.48	.34	1.88	2.22	2.29	17.25
1591	Rocky Mount Oil and Fertilizer Works, Rocky Mount, N.C.	Ajax Special for Tobacco	Rocky Mount	R	7.20	2.20	9.40	.46	1.42	1.88	2.37	17.08
1089	Royster, F.S., Guano Co., Norfolk, Va.	Farmers Bone Fertilizer	Rocky Mount	R	6.08	4 95	11.03	.80	1.37	2 17	2.28	19.38
1399	do	do	Louisburg	R	5.75	2.87	8.62	.72	1.64	2.36	2.08	17.60
1322	do	do	Marshville	S	4.50	3.91	8.41	.79	1.65	2.44	1.68	17.22
1352	Selma Oil and Fertilizer Works, Selma, N.C.	Winston's Special Fertilizer for Cotton.	Franklinton	R	6.95	1.58	8.53	.15	2.67	2.82	2.10	19.01

1402	Selma Oil and Fertilizer Works, Selma, N. C.	Winston's Special Fertilizer for Cotton	Youngsville	R	6.98	1.96	8.94	.01	2.55	2.56	2.25	18.26
1315	Southern Chemical Co., Winston, N. C.	Electric Standard Guano	Raleigh	R	6.95	3.09	10.04	.62	1.76	2.38	2.16	19.03
1376	do	do	Louisburg	R	6.50	3.26	9.76	.80	2.11	2.91	2.31	20.64
1111	do	Electric Tobacco Grower	Burlington	R	5.83	4.48	10.31	.94	1.82	2.76	2.17	20.50
1336	Swift Fertilizer Works, Atlanta, Ga.	Swift's Golden Harvest Standard Guano.	Marshville	R	4.75	4.41	9.16	.61	1.77	2.38	2.31	18.40
1148	Va.-Car. Chemical Co., Richmond, Va.	Allison & Addison's Anchor Brand Fertilizer.	Clinton	S	4.72	3.49	8.21	.67	1.38	2.05	2.15	16.31
1280	do	do	Rockingham	R	6.72	1.54	8.26	1.07	.97	2.04	2.23	16.41
1657	do	Battle Axe Tobacco Guano	Roxboro	R	6.55	2.05	8.60	.70	1.68	2.38	2.44	18.04
1468	do	Blacksburg Soluble Guano	Grover	R	6.60	1.45	8.05	.79	1.74	2.53	2.08	17.63
1458	do	Cotton-Seed Meal Soluble Guano.	Fremont	R	6.23	2.32	8.55	.37	1.99	2.36	2.07	17.52
1262	do	Eagle Island Ammo. Guano	Kinston	R	7.10	1.79	8.89	1.20	.84	2.04	2.14	16.88
1141	do	Eureka Ammoniated Bone	Plymouth	R	6.18	2.43	8.61	.73	1.19	1.92	2.39	16.52
1177	do	Farmers Friend Fertilizer	Edenton	S	5.48	2.71	8.19	.83	1.25	2.08	2.50	16.78
1469	do	do	Earls	S	5.72	2.82	8.54	1.29	.97	2.26	2.35	17.50
1509	do	do	Lenoir	S	5.93	2.31	8.24	.98	1.13	2.11	2.39	16.80
1222	do	Genuine Bone and Peruvian Guano.	Aurora	R	5.77	2.25	8.02	.85	1.19	2.04	2.65	16.66
1615	do	Genuine Bone and Peruvian Guano, for Tobacco.	Semora	R	2.85	4.59	7.44	.40	1.71	2.11	2.50	16.20
1135	do	Genuine Slaughter-house Bone Guano.	Plymouth	S	5.75	2.31	8.06	.55	1.51	2.06	2.39	16.47
1325	do	do	Marshville	S	6.70	1.42	8.12	.76	1.29	2.05	2.31	16.41
1443	do	do	Greensboro	S	5.98	2.62	8.60	.33	1.70	2.03	2.14	16.59
1156	do	National Fertilizer	Louisburg	R	5.72	3.01	8.73	.23	1.94	2.17	2.16	17.18
1471	do	do	Rutherfordton	S	6.73	1.82	8.55	.62	1.41	2.03	2.00	16.39
1330	do	do	Monroe	S	6.78	1 99	8.77	.98	1.08	2.06	1.86	16.53
1204	do	National Spec. Tobacco Fert	Lumberton	R	7.75	1.81	9.56	.92	1.10	2.02	2.11	17.39
1095	do	Old Dominion Soluble Guano	Washington	R	5.95	2.74	8.69	.43	1.74	2.17	2.27	17 26
1119	do	do	Kinston	S	6.70	2.18	8.88	1.25	.70	1.65	2.37	16.84
1163	do	Old Dominion Sol. Tob. Guano	Greenville	S	5.72	2.93	8.65	.86	1.42	2.28	2.14	17.43
1258	do	Old Hickory Guano	Wilson	S	6.92	2.11	9.03	1.15	.89	2.04	1.89	16.72
1092	do	Owl Brand Guano	Rocky Mount	R	3.30	4.73	8.03	.19	1.76	1 95	2.21	15.90
1282	do	do	Wadesboro	S	6.45	1.63	8.08	1.13	1.08	2.21	2.06	16.61
1173	do	Tinsley's Lee Brand Guano	LaGrange	S	6.35	2.63	8.98	.94	1.03	1.97	2.22	16.83
1508	do	do	Lenoir	S	5.38	2.46	7.84	1.48	.57	2.05	2.02	15.84
1191	do	Tinsley's Stonewall Guano	Clinton	S	5.98	2.42	8.40	.67	1.41	2.08	2.19	16.62
1215	do	do	Indian Town	R	6.07	2.64	8.71	1.02	1.07	7.09	2.56	17.34
1520	do	Tinsley's Stonewall Tob. Fert	Winston	S	5.00	2.65	7.65	1 43	.49	1.92	2.11	15.38
1327	Va. State Fertilizer Works, Lynchburg, Va.	Virginia State High Grade Guano.	Monroe	R	7.40	.85	9.25	--------	2.04	2.04	2.34	17.43
1267	Wilson Oil Co., Wilson, N. C	Wilson Standard Guano	Wilson	R	7.55	1.84	9.39	1.32	2.39	3.71	2.40	22.96
1457	do	do	Fremont	R	7.68	2.03	9.71	.68	2.46	3.14	2.55	21.59

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ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1901—Continued.

Laboratory No.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100. Water-Soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-Soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Potash.	Relative Value Per Ton at Factory.
	MIXED FERTILIZERS.											
	Brands claiming						8.50			2.00	2.00	$16.25
1601	Acme Mfg. Co., Wilmington, N. C.	Acme Special Grain Fertilizer	Reidsville	R	5.28	2.55	7.83	2.04	.46	2.50	2.14	17.40
1099	do	Gem Fertilizer	Washington	S	5.85	2.30	8.15	1.98	.63	2.61	1.98	17.86
1337	do	do	Mathews	R	6.20	2.68	8.88	.15	2.25	2.40	1.49	17.31
1470	Ashepoo Fert. Co., Charleston, S. C.	Ashepoo XX Guano	Lattimore	S	6.88	2.86	9.69	.86	1.35	2.21	2.25	18.27
1149	Goldsboro Oil Co., Goldsboro, N. C.	Farmer's Favorite Fertilizer	Clinton	R	7.30	2.23	9.53		2.28	2.28	2.65	18.79
1180	Harrell, S. B. & Co., Norfolk, Va.	Harrell's Champion Cotton and Peanut Grower.	Edenton	R	5.88	3.42	9.30	.18	1.92	2.10	2.51	17.85
1600	Pocomoke Guano Co., Norfolk, Va.	Electric Crop Grower	Reidsville	R	6.43	2.69	9.12	.83	1.32	2.15	2.26	17.57
1107	do	Pocomoke Superphosphate	Washington	R	4.95	4.34	9.29	1.87	.13	2.00	2.21	17.19
1227	do	do	Plymouth	R	5.77	3.18	8.95	.71	1.40	2.11	2.15	17.17
	Brands claiming						8.00			2.50	1.50	16.85
1203	Charlotte Oil and Fert. Co., Charlotte, N. C.	Charlotte Ammoniated Fertilizer.	Lumberton	R	6.75	3.40	10.15	.08	2.63	2.71	1.78	19.76
1545	do	do	Pittsboro	R	5.95	2.16	8.11	.57	2.55	3.12	1.41	18.83
1581	do	do	Lumberton	R	3.78	2.58	6.36	.34	3.14	3.48	2.08	18.15
1338	do	do	Charlotte	R	7.40	1.50	8.00	.39	3.54	3.93	2.05	22.84
1562	Va.-Car. Chem. Co., Richmond, Va.	Raw Bone Superphosphate	Wilson	S	5.65	2.75	8.40	1.26	1.00	2.26	1.63	16.58
	Brands claiming						8.00			2.75	2.00	18.20
1301	N. C. Cotton Oil Co., Raleigh, N. C.	Raleigh Standard Guano	Laurinburg	R	6.97	3.04	10.01	.20	2.87	3.07	2.20	21.25
1397	do	do	Louisburg	S	7.88	3.29	11.17	.50	2.72	3.22	1.98	22.53
1431	do	do	Kittrell	S	8.03	3.16	11.19	.15	2.78	2.93	2.12	21.78
	Brands claiming						8.00			2.50	2.00	17.40
1237	Acme Mfg Co., Wilmington, N. C.	Lattimer's Complete Fertilizer	Lumberton	R	5.57	3.34	7.91	1.26	1.54	2.80	2.19	18.49
1543	do	do	Pittsboro	R	6.33	2.01	8.34	1.08	1.52	2.60	1.99	18.01
1091	Caraleigh Phosphate and Fert. Works, Raleigh, N. C.	Eclipse Ammoniated Guano	Rocky Mount	R	5.58	3.65	9.23	.04	2.46	2.50	2.06	18.57
1373	do	do	Raleigh	R	6.50	2.25	8.75	.84	2.60	3.44	1.93	21.00
1174	Columbia Guano Co., Norfolk, Va.	Columbia High Grade Special Tobacco Guano.	Kinston	S	5.20	2.98	8.18	.85	1.71	2.56	2.21	17.98
1575	do	do	Greensboro	R	5.43	2.90	8.33	1.39	1.38	2.67	3.17	19.53
1193	Navassa Guano Co., Wilmington, N. C.	Navassa Ammoniated Soluble Guano.	Clinton	S	6.70	2.13	8.83	1.10	1.68	2.78	2.63	19.73

1142	do	do	Whiteville	S	6.65	2.52	9.17	1.08	1.54	2.62	2.63	19.53
1132	do	Navassa Guano for Tobacco	Bethel	S	5.95	2.67	8.62	.25	2.43	2.68	2.37	18.94
1669	Va-Carolina Chemical Co., Richmond, Va.	Genuine Slaughter-House Bone for Tobacco.	Pilot Mountain	R	6.63	2.10	8.73	1.05	.95	2.00	1.95	16.46
	Brands claiming						8.00			2.25	2.25	16.87
1133	Richmond Guano Co., Richmond, Va.	Special Premium Brand for Tobacco.	Robersonville	R	6.35	2.74	9.09	.08	2.26	2.34	2.41	18.32
1574	do	do	Stokesdale	S	5.43	5.31	10.74	.60	1.44	2.04	2.59	19.04
	Brand claiming						8.00			2.50	2.50	17.95
1198	American Fert. Co., Norfolk, Va	Bob White Fertilizer	Washington	R	5.72	2.53	8.25	.89	1.55	2.44	2.69	18.19
	Brand claiming						8.00			2.75	2.50	18.75
1270	Wilson Oil Co., Wilson, N. C	Amazon Guano	Wilson	D	7.67	1.88	9.55	.55	2.39	2.94	2.57	20.83
1229	do	Delta Fertilizer	Bethel	R	7.45	2.09	9.54	.47	2.50	2.97	2.59	20.94
	Brands claiming						8.00			2.75	2.75	19.02
1598	Reidsville Fertilizer Co., Reidsville, N. C.	Royal Fertilizer	Reidsville	R	6.05	2.32	8.37	.28	2.49	2.77	3.08	19.78
	Brands claiming						8.00			2.50	3.00	18.50
1097	Acme Mfg. Co., Wilmington, N. C	Tip-Top Tobacco Grower	Washington	R	5.50	2.54	8.04	2.44	.74	3.18	3.57	21.34
1465	do	do	Kenly	D	7.00	1.94	8.94	.05	2.45	2.50	2.62	18.93
1406	Atlantic Chemical Co., Norfolk, Va.	Atlantic Tobacco Grower	Wake Forest	S	5.88	2.92	8.80	1.08	1.51	2.59	3.23	19.76
1236	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Caraleigh Special Tob. Guano	Lumberton	S	6.52	2.13	8.65	.25	2.26	2.51	3.03	19.15
1377	do	do	Raleigh	S	6.75	2.74	9.49	.85	1.71	2.56	2.48	19.46
1363	Cowell, Swan & McCotter Co., Bayboro, N. C.	Cowell, Swan & McCotter Co.'s Potato Guano.	Bayboro	R	5.22	3.75	8.97	.24	2.78	3.02	3.46	21.54
1201	Farmers Guano Co., Raleigh, N. C	Toco Tobacco Guano	Clinton	R	6.75	2.45	9.20	.06	2.27	2.33	3.19	19.24
1375	do	do	Raleigh	S	6.75	2.47	9.22	.88	1.77	2.65	2.81	19.87
1166	Patapsco Guano Co., Baltimore, Md	Patapsco Special Tob. Mixture	Greenville	R	6.75	2.15	8.90	.26	2.03	2.29	3.76	19.47
1462	Piedmont-Mt. Airy Guano Co., Baltimore, Md.	Piedmont Guano for Tobacco	Elm City	R	5.90	3.08	8.98	1.72	1.34	3.06	3.01	21.18
1496	do	do	Kinston	S	6.00	3.60	9.60	1.76	.98	2.74	2.90	20.60
1252	do	do	do	R	5.65	3.39	9.04	1.30	1.15	2.45	3.00	19.28
1171	Powhatan Chem. Co., Richmond, Va.	White Leaf Tobacco Fertilizer	LaGrange	S	7.02	2.92	9.94	.07	2.32	2.39	3.29	20.21
1605	Richmond Guano Co., Richmond, Va.	Tip-Top Fertilizer	Oxford	S	5.35	3.60	8.95	.92	1.65	2.57	3.35	19.96
1563	Rocky Mount Oil and Fertilizer Works, Rocky Mount, N. C.	Blue Star Special for Tobacco	Battleboro	S	7.43	2.18	9.61	.21	2.19	2.40	3.88	20.60
1117	Royster, F. S., Guano Co., Norfolk, Va.	Orinoco Tobacco Guano	Kinston	S	5.80	2.76	8.56	1.02	1.49	2.51	3.32	19.39
1216	do	do	Creedmore	S	5.12	3.29	8.41	.76	1.91	2.67	3.63	20.10
1090	do	do	Rocky Mount	R	3.58	5.03	8.61	.95	1.26	2.21	2.91	18.02
1404	Southern Chemical Co., Winston, N. C.	Pilot Ammoniated Guano	Louisburg	R	6.62	3.12	9.74	.94	1.95	2.89	3.57	21.94
1542	do	do	Morrisville	R	6.75	2.56	9.31	1.35	1.58	2.93	3.62	21.74

N, D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1901—Continued.

Laboratory No.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100. Water-Soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-Soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Potash.	Relative Value Per Ton at Factory.
	MIXED FERTILIZERS.											
1077	Southern Chem. Co., Winston, N. C.	Pilot Ammoniated Guano	Greensboro	R			9.58			2.55	1.86	$18.14
1168	Va.-Carolina Chemical Co., Richmond, Va.	Carolina Golden Belt Ammoniated Guano for Tobacco.	LaGrange	S	7.12	1.90	9.02	1.03	1.40	2.43	3.33	19 56
1602	do	do	Reidsville	S	5.78	3.51	9.29	.75	1.70	2 45	3.00	19.50
1172	do	Killikinnick Tobacco Mixture	LaGrange	S	7 05	2 06	9.11	1.00	1.48	2 48	3.34	19.81
1221	do	N. C. Official Farmers' Alliance Guano.	Aurora	S	6.05	1.96	8.01	1.08	1.42	2.50	3.40	18.95
1588	do	do	Robersonville	R	5.90	2.60	8.50	.77	1.97	2.74	4.30	21.15
1145	do	do	Whiteville	R	7.40	1.46	8.86	1.19	1.36	2 55	3.42	19.90
1386	do	do	Hillsboro	R	5.08	3.45	8.53	.04	2.02	2.06	3.15	17.73
1118	do	Osceola Tobacco Guano	Kinston	S	6.80	1.63	8.43	1.72	1.23	2.95	3.48	20.85
1368	do	do	Ayden	S	6.58	2.38	8.76	1.79	.81	2 60	3.18	19.88
1432	do	do	Hamilton	B	6.70	2.69	9.39	1.20	1.01	2.21	2.88	18.69
	Brands claiming						8 50			2.50	2.50	18.40
1108	Pocomoke Guano Co., Norfolk, Va.	Ciuco Tobacco Grower	Washington	R	7.62	1.89	9.51	.26	2.25	2.51	2.69	19.55
1564	do	do	Washington	R	7.38	1.96	9.34	.94	1.80	2.74	2.83	20.29
	Brands claiming						8.00			3.00	2.00	19.00
1290	Charlotte Oil and Fertilizer Co., Charlotte, N. C.	Special 3 Per Cent Guano	Wadesboro	R	7.05	2.12	9 17	.24	3.13	3.37	2.42	21.70
1351	do	do	Franklinton	S	6.10	1.93	8.03	.16	3.69	3.85	2.68	22.49
1435	Va.-Car. Chem. Co., Richmond, Va.	Cotton Belt Ammo. Guano	Edenton	R	5.65	2.98	8.63	.89	2.48	3.37	2.19	20.96
	Brands claiming						8.00			3.00	2.50	19.55
1098	Acme Mfg. Co., Wilmington, N. C.	Acme Fertilizer	Washington	R	5.18	3.49	8.67	.66	2.48	3.14	2 50	20.60
1281	do	do	Lilesville	R	5.82	2.22	8.04	.89	1.98	2.87	2.57	10.25
1164	do	Acme Fertilizer for Tobacco	Greenville	R	5.45	2.69	8.14	.69	2.48	3.17	2.67	20.41
1398	do	do	Louisburg	R	6.02	2.27	8.29	.78	2.96	3 74	2.84	22.55
1645	do	do	Kenly	R	6.88	1.94	8.82	.60	2.40	3.00	2.54	20.33
1646	do	do	Kirby's Crossing	R	6.23	4.48	10.71	.20	1.43	1.63	1.07	16.03
1268	Branch, A. P., Wilson, N. C.	Atlas Guano	Wilson	D	7.00	2.60	9.60	.45	2.51	2.96	2.46	20.82
1456	Selma Oil and Fertilizer Works, Selma, N. C.	Admiral Fert. for Tobacco	Black Creek	R	7.45	2.33	9.78	.48	2.85	3.33	2.49	22.20
1233	do	Split Silk Fert. for Tobacco	Springhope	R	6.95	1.97	8.92	.61	2.51	3.12	2.30	20.54
1461	do	Yelverton Bros. Plant Food	Fremont	R	7.18	2.12	9.30	.65	2.68	3.33	2.61	21.90

	Brand claiming						8.50			2.75	2.00	18.65
1232	Va.-Car. Chem. Co., Richmond, Va.	Allison & Addison's Anchor Brand Tobacco Fertilizer.	Tarboro	S	6 82	2.06	8.88	1.53	1.06	2.59	2.61	19.15
1264	do	do	Wilson	S	7.57	1.25	8.82	1.19	1.49	2.68	2.39	19.14
	Brands claiming						8.00			2.00	3.00	16.90
1647	Cowell, Swan & McCotter, Bayboro, N.C.	Cowell, Swan & McCotter Co.'s Rust Proof Guano.	Bayboro	S	4 50	3.03	7.53	.61	1.51	2.12	4.24	18.22
1625	Navassa Guano Co., Wilmington, N.C.	Harvest King Soluble Guano	Laurel Hill	R	6.53	2.06	8.59	1.26	.68	1.94	3.08	17.33
	Brands claiming						8.00			3.00	3.00	20.10
1283	American Fert. Co., Norfolk, Va.	American Eagle Guano	Wadesboro	R	7.20	1.73	8.93	1.30	1.69	2.99	3.34	21.28
1369	Armour Fert. Works, Chicago, Ill.	Armour's Tobacco Special	Kinston	R	2.95	7.69	10.64	.63	2.53	3.16	3.38	23.41
1285	do	do	Wadesboro	R	3.37	4.07	7.44	.90	2.06	2.96	4.76	21.40
1312	Bailey, J. L. & Co., Elm City, N.C.	Fairmont Guano	Elm City	R	5.65	3.03	8.68	.56	2.51	3.07	3.63	21.63
1124	Baugh & Sons Co., Norfolk, Va	Baugh's High Grade Tobacco Guano.	Washington	R	5.32	3.86	9.18	1 30	1.89	3.19	3.04	21.81
1104	do	do	do	R	5 92	3.54	9.46	1.56	1.64	3.20	3.15	22.22
1206	do	Grand Rapid Guano	Elizabeth City	R	5.62	3.92	9.54	1.53	1.69	3.22	3.40	22.63
1120	Columbia Guano Co., Norfolk, Va.	Hyco Tobacco Guano	Kinston	S	5.25	2.80	8 05	.96	2.03	2.99	3.65	20.83
1403	do	do	Youngsville	S	5.10	3.12	8.22	1.03	2.14	3.17	3.30	21.17
1385	do	do	Hillsboro	R	2.95	5.45	8.40	.64	2.20	2.84	3.18	20.15
1147	Farmers' Guano Co., Norfolk, Va.	Golden Grade Guano	Clinton	R	6.65	2.54	9.19	.92	1.98	2.90	3.06	20.92
1324	do	do	Marshville	R	6.85	1.85	8.70	.10	2.38	2.48	2.50	18.52
1374	do	do	Raleigh	S	7.25	2.69	9.94	1.10	1.77	2.87	2.56	20.95
1360	Imperial Company, Norfolk, Va.	Imperial Tobacco Guano	Greenville	R	6.05	2.14	8.19	1.87	1.31	3.18	3.76	21.68
1660	Miller Fert. Co., Baltimore, Md.	Standard Phosphate	Manson	S	7.83	1.74	9.57	1.03	1.72	3.85	2.92	20.94
1670	Navassa Guano Co., Wilmington, N.C.	Clarendon Tobacco Guano	Springhope	S	6.45	2.11	8.56	2.30	.94	3.24	2.75	21 10
1125	Pocomoke Guano Co., Norfolk, Va.	Monarch Tobacco Grower	Kinston	R	5.95	3.41	9.36	1.20	1.52	2.72	3.61	21.10
1093	do	do	Washington	R	5.55	3.46	9.01	1.43	1.57	3.00	3.35	21.39
1195	do	do	do	R	6.05	2.90	8.95	1.27	1.57	2.84	3.40	20.88
1350	Ober, G. & Sons, Co., Baltimore, Md	Ober's Special Compound for Tobacco.	Littleton	S	8.35	1.14	9.49	2.21	.92	3.13	3.28	22.16
1342	Powhatan Chem. Co, Richmond, Va.	P. C. Co.'s Hustler	Charlotte	S	5.28	3.39	8.67	.44	2.93	3.37	2.47	21.30
1196	Richmond Guano Co., Richmond, Va.	Gilt Edge Fertilizer	Washington	S	5.72	2.86	8.58	.40	2.56	2.96	3.56	20.91
1522	Southern Chem. Co., Winston, N.C	Daisy Lawn Mixture	Winston	R	7.30	3.08	10.38	.86	2.78	3.64	2 96	24.25
1228	Va.-Car. Chem. Co., Richmond, Va.	Bright Leaf Tobacco Grower	Bethel	R	7.60	1.56	9.16	.71	1.71	2.42	2.63	18.88
1504	do	Farmers' Friend High Grade Fertilizer.	Shelby	S	6.78	1.97	8.75	.61	2.23	2.84	3.50	20.81
1096	do	Farmers' Friend Special Tob. Fertilizer.	Washington	R	6.00	2.37	8.37	1.39	1.66	3.05	3 38	21.01
1554	do	do	Walnut Cove	S	6.20	2.61	8.81	1.55	1.36	2.91	3.47	21.06
1644	do	Golden Leaf Bright Tobacco Guano.	Grifton	S	6.73	1.98	8.71	2.00	.79	2.79	2 86	19.91

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ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1901—Continued.

Laboratory No.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100. Water-Soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-Soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Potash.	Relative Value Per Ton at Factory.
	MIXED FERTILIZERS.											
1656	Va.-Car. Chem. Co., Richmond, Va.	Iseley's Formula of Dis. Bone	Burlington	S	6.30	2.31	8.61	1.66	.97	2.63	2.81	$19.25
1263	do	Old Kentucky High Grade Tobacco Manure.	Kinston	R	6.90	1.81	8.71	1.03	1.25	2.28	3.19	18.64
1618	Va. State Fertilizer Co., Lynchburg, Va.	Dunnington's Special Formula for Tobacco.	Ruffin	D	8.08	2.30	10.38	.45	2.51	2.96	3.00	22.11
1609	do	Phœnix Soluble	Maxton	D	6.98	2.93	9.91	1.34	1.82	3.16	3.45	22.82
	Brands claiming						8.00			3.00	4.00	21.20
1239	Charlotte Oil and Fert. Co., Charlotte, N. C.	Groom's Special Tobacco Fertilizer.	Maxton	R	5.57	3.54	9.11	.13	3.40	3.53	4.19	24.10
1608	do	M. & W. Special Cotton and Tobacco Fertilizer.	Maxton	D	5.10	2.44	7.54	.40	3.18	3.58	4.25	22.92
	Brand claiming						8.00			3.00	5.00	23.30
1299	Wood, T. W. & Sons, Richmond, Va.	Standard Potato Fertilizer	Elizabeth City	R	6.85	2.35	9.20	.12	2.54	2.66	5.17	22.48
	Brand claiming						8.00			4.50	2.50	22.75
1596	Va.-Car. Chem. Co., Richmond, Va.	Tinsley & Co.'s Tobacco Fert.	Williamson	R	6.35	2.17	8.52	2.46	1.49	3.95	2.52	23.08
	Brand claiming						8.00			4.00	3.00	23.30
1251	Va.-Car. Chem. Co., Richmond, Va.	Capital Tobacco Fertilizer	Coleraine	R	6.82	2.15	8.97	1.98	1.69	3.67	2.72	22.81
	Brands claiming						8.00			4.00	4.00	24.40
1300	Lindsay, A. H., Norfolk, Va.	Cumberland Guano	Moyock	R	4.62	4.92	8.54	.80	3.08	3.88	4.60	26.06
1582	Navassa Guano Co., Wilmington, N. C.	Coree Tobacco Guano	Whiteville	S	3.05	5.02	8.07	3.37	1.47	4.84	4.07	27.23
1261	do	do	Kinston	S	7.50	1.57	9.07	1.42	2.54	3.96	4.58	25.87
	Brand claiming						8.00			4.00	5.00	25.50
1521	Southern Chem. Co., Winston, N. C.	Garden and Fruit Special Fert.	Winston	S	6.83	2.41	9.24	2.35	1.75	4.10	5.78	27.79
	Brand claiming						8.00			5.00	5.00	28.70
1297	Va.-Car. Chem. Co., Richmond, Va.	Norfold Truck and Tomato Grower.	Edenton	S	6.62	1.85	8.47	3.40	1.63	5.03	5.52	29.79
	Brand claiming						8.00			5.00	7.00	30.90
1668	Armour Fert. Works, Chicago, Ill.	Armour's Bone, Blood and Potash Fertilizer.	Wilmington	S	3.85	4.41	8.26	2.54	3.04	5.58	7.45	33.48
	Brand claiming						8.00			6.00	5.00	31.90
1359	Va.-Car. Chem. Co., Richmond, Va.	Owl Brand Truck Guano	Ayden	S	6.58	1.75	8.33	4.13	1.82	5.95	4.83	31.85
	Brand claiming						9.00			2.25	1.00	16.40

1286	Bradley Fert. Co., Boston, Mass.	B. D. Sea-Fowl Guano	Morven	D	7.47	2.23	9.70	.82	1.60	2.42	1.52	18.15
	Brand claiming						9.00			2.00	2.00	16.70
1303	Etiwan Fert. Co., Charleston, S. C.	Plow Brand Ammoniated Dissolved Bone.	Gibson	R	6.77	2.52	9.29	1.45	.74	2.19	2.28	17.88
1627	Lazaretto Guano Co., Baltimore, Md.	Gold Dust Guano	Edenton	D	6.65	2.35	9.00	1.39	.55	1.86	2.07	16.33
1249	Ober, G. & Sons Co., Baltimore, Md.	Ober's Special Ammoniated Dissolved Bone.	Ahoskie	R	9.97	1.44	11.41	.59	1.66	2.25	2.53	20.25
1544	Piedmont-Mt. Airy Guano Co., Baltimore, Md.	Piedmont Essential Tobacco Compound.	Durham	R	5.15	3.69	8.84	1.15	.89	2.04	2.46	17.19
1606	Pocahontas Guano Co., Lynchburg, Va.	Standard Tobacco Guano	Oxford	R	5.13	4.47	9.60	.76	1.49	2.25	2.48	18.57
1659	do	Yellow Tobacco Special	Walnut Cove	S	6.63	2.88	9.51	.73	1.27	2.00	2.10	17.27
	Brands claiming						9.00			2.50	2.00	18.30
1460	Charlotte Oil and Fertilizer Co., Charlotte, N. C.	Charlotte High Grade Special Tobacco Fertilizer.	Fremont	R	6.38	2.97	9.35		3.01	3.01	2.23	20.50
1260	Va.-Car. Chem. Co., Richmond, Va.	Eureka Ammoniated Bone	Wilson	S	7.72	1.85	9.57	1.26	1.35	2.61	2.21	19.39
1553	do	Owl Brand Special Tob. Guano	Walnut Cove	D	7.10	2.61	9.71	1.68	.70	2.38	2.12	18.69
	Brand claiming						9.00			2.50	2.50	18.85
1169	Meadows, E. H. & J. A. Co., New-Bern, N. C.	Meadows' All Crop Guano	Lagrange	R	4.65	3.83	8.84	.66	1.93	2.59	2.77	18.97
	Brand claiming						9.25			2.50	2.00	18.52
1112	Patapsco Guano Co., Baltimore, Md.	Patapsco Guano	Washington	R	7.02	2.92	9.94	.52	2.06	2.58	2.21	19.63
1217	do	do	Warrenton	R	6.90	3.34	10.24	.74	1.80	2.54	2.41	19.66
1159	do	Patapsco Guano for Tobacco	Henderson	R	6.58	3.54	10.12	.42	2.23	2.65	2.35	20.17
1617	Wariner, W. H. & Co., Ruffin, N. C.	North Carolina Special	Ruffin	R	8.00	2.32	10.32	1.08	1.55	2.63	2.26	20.19
	Brand claiming						9.00			2.75	1.50	18.55
1607	Va.-Car. Chem. Co., Richmond, Va	Allison & Addison's Special State Brand Tob. Manure.	Rougemont	S	6.55	2.63	9.18	1.91	.86	2.87	1.68	19.29
	Brands claiming						9.00			2.75	2.00	19.10
1235	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Pacific Tobacco and Cotton Grower.	Lumberton	R	7.70	2.50	10.20	.26	2.34	2.60	2.07	19.78
1372	do	do	Raleigh	R	7.35	2.15	9.50	.02	3.16	3.18	1.97	20.89
1126	Goldsboro Oil Co., Goldsboro, N. C.	Prolific Cotton Grower	Kinston	R	7.80	2.40	10.20	.29	2.48	2.77	2.56	20.86
1464	do	do	Elm City	R	7.43	2.12	9.55	.58	2.60	3.18	3.11	22.19
	Brands claiming						9.00			2.25	4.00	19.70
1616	Pocahontas Guano Co., Lynchburg, Va.	High Grade 4 Per Cent Potash Tobacco Compound.	Ruffin	R	6.80	2.72	9.52	1.68	.61	2.29	4.01	20.31
	Brands claiming						9.00			2.50	5.00	21.60
1620	Southern Chem. Co., Winston, N. C	Sun Brand Guano	Ruffin	R	6.85	2.99	9.84	1.07	1.49	2.56	5.10	22.66
	Brand claiming						9.00			3.00	2.00	19.90
1318	Va.-Car. Chem. Co., Richmond, Va.	L. and M. Special Guano	Raleigh	S	6.45	2.03	8.48	1.72	1.41	3.13	2.37	20.25
1539	do	do	Raleigh	S	6.58	2.73	9.31	1.54	.92	2.46	2.48	18.98
	Brands claiming						9.00			3.00	3.00	21.00
1162	Lazaretto Guano Co., Baltimore, Md.	Special Tobacco and Potato Fertilizer.	Greenville	R	5.08	3.99	9.07	1.28	1.72	3.00	3.47	21.58
1170	Meadows, E. H. & J. A. Co., New-Bern, N. C.	Meadows' Gold Leaf Tobacco Guano.	LaGrange	R	4.38	3.91	8.29	.30	2.71	3.01	3.57	21.02

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ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1891—Continued.

Laboratory No.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100. Water-Soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-Soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Potash.	Relative Value Per Ton at Factory.
	MIXED FERTILIZERS.											
	Brands claiming						9.00			3.00	3.00	$21.00
1401	Patapsco, Guano Co., Baltimore, Md	Patapsco Tobacco Fertilizer	Youngsville	R	8.00	2.03	10.03	.63	2.54	3.17	3.57	23.10
1115	do	do	Washington	R	8.48	1.78	10.26	.85	1.86	2.71	3.47	21.72
1619	Pocahontas Guano Co., Lynchburg, Va.	Pocahontas Special Tobacco Fertilizer.	Ruffin	----	7.60	2.49	10.09	1.48	1.35	2.83	3.27	21.73
	Brand claiming						9.00			3.00	5.00	23.20
1661	American Fert. Co., Norfolk, Va	Special Formula for Yellow Leaf Tobacco.	Springhope	R	7.03	1.50	8.53	1.81	1.59	3.40	5.82	24.96
	Brand claiming						9.00			3.50	5.00	24.80
1197	American Fert. Co., Norfolk, Va	Pitt County Special Fertilizer	Washington	R	4.65	3.38	8.03	2.73	1.18	3.91	5.01	25.25
	Brand claiming						9.00			3.00	6.00	24.30
1597	Reidsville Fert. Co., Reidsville, N.C.	Lion Brand Fertilizer	Reidsville	R	5.50	3.43	8.93	.48	2.32	2.80	5.94	23.53
	Brand claiming						5.00			5.00	8.00	29.30
1154	Bragaw, Wm. & Co., Washington, N.C.	River View Potato Grower	Washington	R	3.72	2.83	6.55	1.48	3.59	5.07	8.76	31.75
	Brand claiming						5.00			10.00	2.50	39.25
1367	Baugh & Sons Co., Norfolk, Va	Baugh's New Process 10 Per Cent Guano.	Oriental	S	4.42	2.64	7.06	7.88	1.95	9.83	3.17	41.30
	Brand claiming						5.00			10.00	3.00	39.80
1122	Armour Fert. Works, Chicago, Ill	Armour's Ten Per Cent Trucker.	Kinston	R	2.52	4.03	6.56	2.16	7.53	9.69	3.36	40.60
	Brand claiming						6.00			2.00	6.00	18.40
1434	Va.-Car. Chem. Co., Richmond, Va	Old Dominion Sweet Potato Guano.	Edenton	R	4.75	1.93	6.68	1.18	1.10	2.28	5.59	19.40
	Brand claiming						6.00			4.00	4.00	22.60
1587	Va.-Car. Chem. Co., Richmond, Va	Tinsley's Strawberry Guano	Edenton	R	4.65	1.88	6.53	2.58	1.27	3.85	4.21	22.83
	Brand claiming						6.00			5.00	7.00	29.10
1105	Baugh & Sons Co., Norfolk, Va	Baugh's Peruvian Guano Substitute.	Washington	S	4.80	3.02	7.82	3.43	1.61	5.04	7.64	31.77
1225	do	do	Pantego	S	4.70	3.16	7.86	3.52	1.36	4.88	7.59	31.04
	Brand claiming						6.00			6.00	6.00	31.20
1628	Va.-Car. Chem. Co., Richmond, Va	Tinsley's Irish Potato Grower	Elizabeth City	R	5.63	.92	6.55	3.75	1.40	5.27	6.15	29.52
	Brands claiming						6.00			7.00	5.00	33.30
1183	Baugh & Sons Co., Norfolk, Va	Baugh's Cabbage Guano	Elizabeth City	R	4.95	2.38	7.33	5.49	1.48	6.97	5.56	35.02

1370	do	do	Kinston	S	4.45	3.36	7.81	5.28	1.99	7.27	5.17	35.98
1223	Baugh & Sons Co., Norfolk, Va	Baugh's 7 Per Cent Potato Guano.	Aurora	R	4.22	3.09	7.31	5.43	1.66	7.09	5.54	35.36
1184	do	do	Elizabeth City	R	4.65	2.94	7.59	5.07	1.58	6.65	5.62	34.29
1208	Pocomoke Guano Co., Norfolk, Va.	Freeman's 7 Per Cent Irish Potato Grower.	Winton	R	4.72	2.88	7.60	3.37	3.82	7.19	5.18	35.88
1585	do	Seaboard Popular Trucker	Edenton	S	4.98	2.16	7.14	5.08	1.41	6.49	5.36	33.09
1584	Upshur, R. L., Norfolk, Va	Upshur's 7 Per Cent Potato Guano.	Elizabeth City	R	4.33	2.79	7.12	3.32	2 94	6.26	5.38	32.36
	Brands claiming						7.00			5.00	5.00	27.80
1361	Cowell, Swan & McCotter Co., Bayboro, N. C.	Cowell, Swan & McCotter's Co.'s High Grade Truck Guano.	Alliance	R	4.35	2.46	6.81	1.73	3.81	5.54	6 49	30.99
1113	Lazaretto Guano Co., Baltimore, Md.	Early Trucker	Washington	R	6.18	2.05	8.23	1.80	2.95	4.76	5.32	28.49
1588	Patapsco Guano Co., Baltimore, Md.	Patapsco Early Trucker for Quick Growth.	Bethel	R	5.45	2.88	8.33	2.56	2.34	4.90	5.49	29.21
1224	Pocomoke Guano Co., Norfolk, Va.	Standard Truck Guano	Pantego	R	5.40	2.81	8 21	2.38	2.31	4.69	5.33	28.26
1150	Royster, F. S. Guano Co.. Norfolk, Va	Royal Potato Guano	Bethel	R	5.22	3.07	8.29	2.54	2.46	5.00	5.11	29.08
	Brands claiming						7.00			5.00	7.00	30.00
1182	Navassa Guano Co., Wilmington, N. C.	Navassa Root Crop Fertilizer	Elizabeth City	D	4.60	3.02	7.62	2.61	2.31	4.92	6.70	29.97
1266	do	do	Kinston	S	6.80	.85	7.65	2.91	1.65	4.56	6.95	29.12
	Brands claiming						7.00			5.00	8 00	31.20
1114	Lazaretto Guano Co., Baltimore, Md.	Pamlico Trucker	Washington	R	5.48	2.55	8.03	2.32	2.71	5.03	8.61	32.79
1493	Meadows, E. H. & J. A. Co., New-Bern, N. C.	Meadows' Great Potato Grower	Kinston	R	5.25	2.52	7.77	2.44	2.93	5.37	8.25	33.25
	Brands claiming						7.00			7.00	5.00	34.20
1178	American Fert. Co., Norfolk, Va	Standard 7 Per Cent Ammonia Guano.	Edenton	R	3.42	3.03	6.45	5.32	1.55	6.87	5.81	34.21
1037	do	do	Greenville	R			6.07			6.58	4.91	31.21
1100	Lazaretto Guano Co., Baltimore, Md	Truckers' Favorite	Washington	R	5.05	1.98	7.03	3.57	3 20	6.77	5.49	34.03
	Brands claiming						7.00			7.00	7.00	36.40
1494	Meadows, E. H. & J. A. Co., New-Bern, N. C.	Meadows' Great Cabbage Guano.	Kinston	R	5.25	1.97	7.22	4.84	2.31	7.15	7.58	37.72
1366	do	do	Oriental	R	3.92	3.01	6.93	3.17	3.01	6.18	8.18	35.01
	Brands claiming						10.00			2.50	3.00	20.30
1353	Southern Chem. Co., Winston, N.C.	Pilot Guano—Spe. Compound	Franklinton	R	8.22	2.22	10.44	1.20	1.52	2.72	3.97	22.47
1400	do	do	do	R	8.45	2.44	10.89	.63	2.09	2.72	4.10	23.01
1241	Columbia Guano Co.. Norfolk, Va.	5-10-5 Special Tobacco Guano	Maxton	R	8.17	3.65	11.77	2.57	2.38	4.95	5.28	32.20
	Brand claiming						8.00			2.00		13.60
1185	Baugh & Sons Co., Norfolk, Va	Baugh's Special Cotton Guano.	Elizabeth City	R	5.92	5.02	10.94	.55	1.61	2.16		16.76
	Brand claiming						12.00			2.00		17.20
1188	Home Fertilizer Chemical Works, Baltimore, Md.	Slingluff's Pure Dissolved Bone.	Elizabeth City	R	10.22	2.80	13.02	1.52	1.13	2.65		20.20
	Brand claiming						8.00				2.00	9.40
1603	Reidsville Fertilizer Co., Reidsville, N. C.	Bone and Potash	Reidsville	R	8.18	2.61	10.79				2.27	12.21

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ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1901—Continued.

Laboratory No.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.							Relative Value Per Ton at Factory.
					Water-Soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-Soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Potash.	
	MIXED FERTILIZERS.											
	Brands claiming						8.00				2.25	9.68
1477	Navassa Guano Co., Wilmington, N. C.	Warlick's Mixture	Forest City	N	1.83	6.78	8.61				2.07	10.02
1389	Va.-Car. Chem. Co., Richmond, Va.	Allison & Addison's McGavock's Spe. Potash Mixture	Burlington	R	4.22	6.33	10.55				1.79	11.46
1426	do	do	Monroe	D	6.68	2.29	8.97				2.02	10.29
	Brands claiming						8.50				2.00	9.85
1425	Va.-Car. Chem. Co., Richmond, Va.	Old Dominion Dissolved Bone and Potash.	Monroe	D	5.65	3.25	8.90				2.01	10.22
1487	do	do	Lexington	R	6.33	2.52	8.85				2.01	10.17
1476	do	do	Lattimore	S	5.29	4.71	10.00				1.87	11.06
1611	Va. State Fertilizer Co., Lynchburg, Va.	Gilt Edge Dissolved Bone and Potash.	Mocksville	D	4.30	4.10	8.40				2.26	10.05
	Brand claiming						8.00				3.00	10.50
1341	Charlotte Oil and Fertilizer Co., Charlotte, N. C.	McCrary's Diamond Bone and Potash.	Charlotte	R	3.75	6.63	10.38				2.59	12 19
	Brands claiming						10.00				1.00	10.01
1650	Charlotte Oil and Fertilizer Co, Charlotte, N. C.	Dissolved Bone and Potash	Taylorsville	D	3.85	5.51	9.36				1.15	9.69
1524	Southern Chemical Co., Winston, N. C.	Quick Step Soluble Bone and Potash.	Winston	R	7.73	2.91	10.64				1.55	11.28
1512	Va.-Car. Chemical Co, Richmond, Va.	Planters' Bone and Potash Mixture.	Cherryville	R	7.45	2.32	9.77				2.38	11.41
	Brands claiming						10.00				1.50	10.65
1413	Va.-Car. Chem. Co., Richmond, Va.	Great Wheat and Corn Grower	Kings Mount'in	R	3.78	7.03	10.81				1.61	11.50
1387	do	do	Stovall	R	8.22	4.03	12.25				1.30	12.45
	Brands claiming						10.00				2.00	11.20
1619	Acme Mfg. Co., Wilmington, N. C.	Acme Bone and Potash	Statesville	R	7.90	2.92	10.82				1.64	11.54
1438	American Fertilizer Co, Norfolk, Va.	Dissolved Bone and Potash Guano for Wheat and Corn.	Goose Neck	R	9.88	2.35	11.73				1.81	12.55
1474	do	do	Shelby	S	7.63	2.94	10.57				1.72	11.40
1629	do	do	Shelby	R	1.78	9.01	10.79				2.30	12.24
1499	Armour Fertilizer Works, Chicago, Ill.	Armour's Phosphate and Bone—No. 1.	New Bern	R	.85	6.82	7.67				2.80	9.98

1388	Atlantic Chemical Co., Norfolk, Va.	Atlantic Bone and Potash Mixture.	Burlington	S	5.29	6.18	11.47				1.64	12.13
1475	do	do	Lattimore	R	4.83	6.80	10.03				1.96	11.18
1662	Charlotte Oil and Fertilizer Co, Charlotte, N.C.	10-2 Bone and Potash	Barber Juncti'n	R	5.90	5.01	10.91				2.07	12.09
1128	Columbia Guano Co., Norfolk, Va.	Columbia Bone and Potash Mixture.	Kinston	S	5.30	4.72	10.02				2.03	11.25
1513	do	do	Cherryville	R	6.18	4.58	10.76				1.66	11.51
1447	do	do	Greensboro	R	5.68	4.71	10.39				1.93	11.47
974	do	do	Greensboro	R			9.67				1.84	10.73
1498	Meadows, E. H. & J. A. Co., New-Bern, N.C.	Meadow's Dissolved Bone and Potash Compound.	Kinston	S	7.30	3.75	11.05				1.91	12.04
1579	Navassa Guano Co., Wilmington, N.C.	Navassa Dissolved Bone and Potash.	Walnut Cove	R	4.03	6.02	10.05				1.96	11.20
1663	Piedmont-Mount Airy Guano Co., Baltimore, Md.	Farmers' High Grade Bone and Potash.	Warrenton	R	1.68	8.07	9.75				2.52	11.55
1190	Royster, F.S., Guano Co., Norfolk, Va.	Royster's Bone and Potash Mixture.	Clinton	S	7.12	3.61	10.73				1.70	11.53
1567	do	do	Wilson	S	1.03	6.85	7.88				1.72	8.98
1610	Southern Chemical Co., Winston, N.C.	Mammoth Corn Grower	Oxford	R	6.48	3.87	10.35				2.27	11.81
1354	Va.-Car. Chemical Co., Richmond, Va.	Allison & Addison's B. P. Potash Mixture.	Scotland Neck	R	3.97	6.38	10.35				1.95	11.46
1511	do	do	Shelby	R	8.33	3.21	11.54				1.84	12.41
1523	do	do	Winston	D	4.13	6.59	10.72				1.63	11.44
1257	do	Capital Bone and Potash Compound.	Powellsville	R	7.70	2.72	10.42				2.05	11.63
1556	Va.-Car. Chem. Co., Richmond, Va.	do	Walnut Cove	R	6.73	3.67	10.40				1.78	11.32
1592	do	Dissolved Bone and Potash	Graham	R	5.98	4.07	10.05				1.92	11.16
1515	do	Eureka Bone and Potash	Hickory	R	3.78	7.12	10.90				1.70	11.68
1424	do	High Grade Alkaline Bone and Potash.	Monroe	S	5.42	4.31	9.73				2.28	11.26
1568	do	do	Englehard	R	6.10	3.84	9.94				1.72	10.84
1087	do	Norfolk Bone and Potash Fertilizer.	Greensboro	R			8.63				1.80	9.75
1445	do	do	Greensboro	R	2.60	7.65	10.25				1.68	11.07
1473	do	Owl Brand Acid Phosphate with Potash.	Patterson	S	6.18	4.55	10.65				1.97	11.75
1648	do	Standard Wheat Grower	Statesville	R	2.63	4.99	10.62				1.40	11.10
1199	do	Tinsley's Bone and Potash Mixture.	Clinton	R	6.77	3.75	10.52				1.75	11.39
1634	Virginia State Fertilizer Co., Lynchburg, Va.	High Grade Dissolved Bone and Potash.	Lattimore	R	7.58	3.89	11.47				2.10	12.63
	Brand claiming						10.00				4.00	13.40
1514	Southern Chemical Co., Winston, N.C.	Winner Grain Mixture	Hickory	R	7.63	3.64	11.27				4.32	14.81
	Brand claiming						11.00				2.00	12.10
1186	Pocomoke Guano Co., Norfolk, Va.	Alkali Bone	Clinton	R	8.10	4.31	12.41				2.00	13.37

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ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1901—Continued.

Laboratory No.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100. Water-Soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-Soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Potash.	Relative Value Per Ton at Factory.
	MIXED FERTILIZERS.											
	Brand claiming						11.00				5.00	$15.40
1160	Patapsco Guano Co., Baltimore, Md.	Patapsco High Grade Bone and Potash	Franklinton	R	7.05	4.44	11.49				5.05	15.89
	Brand claiming						12.00				3.00	14.10
1444	Southern Chemical Co., Winston, N. C.	Reaper Grain Application	Gibsonville	R	9.45	5.20	14.65				3.28	16.79
	Brand claiming									9.00	2.50	31.45
1658	Home Fertilizer Chemical Works, Baltimore, Md.	Cerealite Top Dressing	Monroe	B						8.89	4.26	33.13
	RAW OR UNMIXED FERTILIZER MATERIALS.											
	Brands claiming						10.00					8.00
1639	Charlotte Oil and Fertilizer Company, Charlotte, N. C.	Catawba Acid	Huntersville	R	3.08	5.82	8.90					7.12
1673	Navassa Guano Company, Wilmington, N. C.	Croatan Acid Phosphate	Mt. Airy	R	3.15	6.91	10.06					8.05
1395	Southern Chemical Company, Wilmington, N. C.	Horse Shoe Brand Acid Phosphate.	Burlington	R	5.78	4.24	10.02					8.02
1638	Richmond Guano Company, Richmond, Va.	Old Homestead Dissolved Bone.	Canton	B	5.63	4.43	10.06					8.05
1390	Va.-Car. Chem. Company, Richmond, Va.	Allison & Addison's Rocketts Acid Phosphate.	Chapel Hill	R	2.05	9.07	11.12					8.90
1637	do	Champion Acid Phosphate	Brevard	D	2.55	8.61	11.16					8.93
1533	do	Eureka Acid Phosphate	Charlotte	R	7.35	4.04	11.39					9.11
1672	do	Norfolk Soluble Bone	Pilot Mountain	R	6.55	4.63	11.18					8.94
1526	do	Tinsley's Stonewall Brand Acid Phosphate.	Winston	R	4.10	6.01	10.11					8.09
1348	do	do	Charlotte	R	4.78	4.52	9.30					7.44
	Brands claiming						12.00					9.60
1593	Atlantic Chem. Co., Norfolk, Va.	Atlantic Acid Phosphate	Ore Hill	R	6.70	5.72	12.42					9.94
1525	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Staple Acid Phosphate	Winston	R	9.88	4.73	14.61					11.69

1636	Columbia Guano Co., Norfolk, Va.	Columbia High Grade Acid Phosphate.	Murfreesboro	R	5.90	5.92	11.82					9.46
1152	Navassa Guano Co., Wilmington, N. C.	Navassa Acid Phosphate	Whiteville	R	11.30	2.33	13.63					10.90
1557	do	do	Rural Hall	R	5.98	6.78	12.76					10.21
1419	Richmond Guano Co., Richmond, Va.	Dissolved S. C. Phosphate	Greensboro	S	7.90	4.31	12.21					9.77
1274	Royster, F. S. Guano Co., Norfolk, Va.	Royster's High Grade X X Acid Phosphate.	Wilson	R	6.35	5.15	11.50					9.20
1393	do	do	Burlington	R	7.08	5.36	12.44					9.95
1394	Southern Chem. Co., Winston, N. C	Tar Heel Acid Phosphate	do	R	7.40	4.91	12.31					9.85
1246	Va.-Car. Chem. Co., Richmond, Va.	Allison & Addison's Standard Acid Phosphate.	Tarboro	D	10.70	2.02	12.70					10.18
1247	do	Capital Dissolved S. C. Bone	Wilson	R	11.22	2.25	13.47					10.78
1417	do	do	King's Mount'n	S	8.65	4.27	12.92					10.34
1652	do	Our Acid Phosphate	Statesville	D	7.78	5.13	12.91					10.33
1416	do	Owl Brand Acid Phosphate	Kings Mount'n	S	7.88	5.05	12.93					10.34
1187	do	Royster's High Grade Acid Phosphate.	Edenton	D	9.18	2.95	12.13					9.70
1516	do	do	Lincolnton	R	11.10	1.79	12.89					10.31
	Brands claiming						13.00					10.40
1243	Acme Mfg. Co., Wilmington. N. C.	Acme Acid Phosphate	Lumberton	D	11.95	2.00	13.95					11.16
1452	do	do	Greensboro	S	9.60	3.47	13.07					10.46
1429	Armour Fert. Works, Chicago, Ill.	Armour's Acid Phosphate	Monroe	R	1.30	12.11	13.41					10.73
1565	do	do	Washington	D	4.63	8.62	13.25					10.60
1532	Ashepoo Fert. Co., Charleston, S. C.	Carolina Acid Phosphate	Monroe	R	11.78	2.32	14.10					11.28
1415	Atlantic Chem. Co., Norfolk, Va.	Atlantic High Grade Dissolved Bone.	China Grove	R	8.75	5.19	13.94					11.15
1378	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Sterling High Grade Acid Phosphate.	Raleigh	R	10.80	3.87	14.67					11.74
1391	do	do	Mebane	R	10.62	4.24	14.86					11.89
1414	do	do	Concord	R	8.90	5.69	14.59					11.67
1345	Charlotte Oil and Fertilizer Co., Charlotte, N. C.	Charlotte Acid Phosphate	Charlotte	S	10.08	3.33	13.41					10.73
1546	do	do	Pittsboro	R	10.33	3.22	13.55					10.84
1527	Columbia Guano Co., Norfolk, Va.	Columbia High Grade Dissolved Bone.	Greensboro	R	9.78	3.89	13.67					10.94
1307	Etiwan Fert. Co., Charleston, S. C.	Diamond Soluble Bone	Gibson	R	8.40	3.62	12.02					9.62
1380	Farmers Guano Co., Raleigh, N. C.	Farmers' High Grade Acid Phosphate.	Raleigh	R	10.12	3.09	13.21					10.57
1244	MacMurphy, W. C. Co., Charleston, S. C.	High Grade Acid Phosphate	Maxton	R	10.78	2.74	13.52					10.82
1294	do	do	Wadesboro	R	11.10	2.16	13.26					10.61
1151	Navassa Guano Co., Wilmington, N. C.	Navassa High Grade Dissolved Bone.	Chadbourn	S	10.80	2.58	13.38					10.70
1333	do	do	Waxhaw	S	8.08	4.38	12.46					9.97
1641	Pocomoke Guano Co., Norfolk, Va.	Hampton Acid Phosphate	Dallas	N	9.75	3.35	13.10					10.48
1276	Powhatan Chem. Co., Richmond, Va.	Powhatan Acid Phosphate	Wilson	S	8.10	4.91	13.01					10.41

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ANALYSES OF COMMERCIAL FERTILIZERS--SPRING SEASON, 1901—Continued.

Laboratory No.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.							Relative Value Per Ton at Factory.
					Water-Soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-Soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Potash.	
	RAW OR UNMIXED FERTILIZER MATERIALS.											
	Brands claiming						13.00					$10.40
1448	Powhatan Chem. Co., Richmond, Va.	Powhatan Acid Phosphate	Greensboro	S	7.85	4.10	11.95					9.56
1292	Richmond Guano Co., Richmond, Va.	Premium Dissolved Bone	Rockingham	R	8.25	4.29	12.54					10.03
1569	Rocky Mount Oil and Fertilizer Works, Rocky Mount, N. C.	Blue Star Acid Phosphate	Rocky Mount	R	11.55	3.75	15.30					12.24
1161	Royster, F. S. Guano Co., Norfolk, Va.	Royster's High Grade Dissolved Bone.	Henderson	S	7.05	6.28	13.33					10.66
1355	do	do	Weldon	S	7.72	5.34	13.06					10.45
1479	do	do	Lattimore	R	6.13	7.60	13.73					10.98
1653	Southern Chem. Co., Winston, N. C.	Victor Dissolved Bone	Hickory	R	8.50	4 57	13.07					10.46
1347	do	Victor High Grade Acid Phosphate.	Charlotte	D	9.42	3.96	13.38					10.70
1450	do	do	Greensboro	R	8.53	4.58	13.11					10.49
1293	Va.-Car. Chemical Co., Richmond, Va.	Allison's & Addison's I X L Acid Phosphate.	Rockingham	R	10.62	1.92	12.54					10.03
1549	do	do	Raleigh	R	8.88	3.25	12.13					9.70
1604	do	Almont High Grade Acid Phosphate.	Reidsville	D	11.73	2.96	14.69					11.75
1478	do	Blacksburg Dissolved Bone Phosphate.	Grover	S	11.00	2.82	13.82					11.06
1309	do	Cotton Brand High Grade Acid Phosphate.	John's Station	R	10.00	2.39	12.39					9.91
1140	do	Crenshaw's Acid Phosphate	Plymouth	R	11.65	2.18	13.83					11.06
1534	do	do	Charlotte	R	7.05	5.96	13.01					10.41
1200	do	Double Bone Phosphate—Extra Strong.	Clinton	S	11.35	2.13	13.48					10.78
1332	do	do	Waxhaw	D	5.87	7.57	13.44					10.75
1466	do	Durham High Grade Acid Phosphate.	Black Creek	R	10.65	2.91	13.56					10.85
1137	do	Norfolk Best Acid Phosphate	Plymouth	D	10.97	2.31	13.28					10.62
1346	do	Old Dominion High Grade Bone Phosphate.	Charlotte	R	11.28	1.87	13.15					10.52

1275	Va.-Car. Chem. Co., Richmond, Va.	Old Dominion High Grade Bone Phosphate.	Wilson	R	11.25	2.29	13.54					10.83
1319	do	Owl Brand Acid Phosphate	Raleigh	R	8.95	5.06	14.01					11.21
1580	do	do	Edenton	D	9.78	3.54	13.32					10.66
1153	do	Standard Dissolved S.C.Bone	Whiteville	S	11.55	2.36	13.91					11.13
1320	do	do	Raleigh	D	8.02	4.72	12.74					10.19
1295	do	do	Morven	R	11.72	2.32	14.04					11.23
1630	do	Tinsley's Dissolved S. C. Bone	Jonesboro	R	10.20	2.65	12.85					10.28
	Brands claiming						14.00					11.20
1451	Acme Manufacturing Company, Wilmington, N. C.	Acme Acid Phosphate	Greensboro	S	9.33	4.12	13.45					10.76
1139	American Fertilizer Co., Norfolk, Va.	High Grade Acid Phosphate	Plymouth	D	11.55	2.71	14.26					11.41
1502	do	do	Newbern	N	11.38	2.99	14.37					11.50
1343	do	do	Polkton	R	11.98	1.37	13.35					10.68
1439	Arps, G. L. and Co., Norfolk, Va.	Acid Phosphate	Aulander	R	5.18	6.74	11.92					9.54
1305	Atlantic Chem. Co., Norfolk, Va.	Atlantic 14 Per cent Acid Phosphate.	Edenton	R	5.10	7.62	12.72					10.18
1209	Baugh & Sons Co., Norfolk, Va.	Baugh's High Grade Acid Phosphate.	Elizabeth City	R	11.77	3.39	15.16					12.13
1379	Caraleigh Phos. and Fert. Works, Raleigh, N. C.	Climax Dissolved Bone	Raleigh	R	11.55	4.03	15.58					12.46
1517	do	do	Newton	R	8.65	5.76	14.41					11.53
1559	Columbia Guano Co., Norfolk, Va	Columbia 14 per cent Acid Phosphate.	Edenton	D	11.53	4.51	16.04					12.83
1101	Columbia Guano Co., Norfolk, Va.	Columbia 14 per cent Acid Phosphate.	Washington	R	9.32	4.03	13.35					10.64
1654	Cowell, Swan & McCotter Co., Bayboro, N. C	Cowell, Swan & McCotter Co.'s Bone Phosphate.	Stonewall	D	11.93	2.78	14.71					11.77
1254	Harrell, S. B. & Co., Norfolk, Va.	Harrell's Acid Phosphate	Coleraine	D	9.30	5.50	14.80					11.84
1594	Imperial Company, Norfolk, Va.	Imperial High Grade Acid Phosphate.	Gates	S	11.53	2.47	14.00					11.20
1116	Lazaretto Guano Co., Norfolk, Va.	Dissolved Bone Phosphate	Washington	D	10.40	3.62	14.02					11.22
1500	Meadows, E. H., & J. A., Co., Newbern, N. C.	Diamond Acid Phosphate	Kinston	S	10.60	3.20	13.80					11.04
1428	Patapsco Guano Co., Baltimore, Md.	Patapsco Pure Dissolved S. C. Phosphate.	Goose Neck	R	11.25	3.41	14.66					11.73
1127	Pocomoke Guano Co., Norfolk, Va	Peerless Acid Phosphate	Newbern	R	11.30	4.27	15.57					12.46
1218	do	do	Winton	D	11.12	3.69	14.81					11.85
1430	Rasin-Monumental Co., Baltimore, Md.	Rasin's Acid Phosphate	Monroe	R	11.95	1.98	13.93					11.14
1467	do	do	Elm City	R	11.78	1.86	13.64					10.91
1242	do	do	Lumberton	R	11.32	1.83	13.15					10.52
1357	Richmond Guano Co., Richmond, Va.	High Grade Acid Phosphate	Franklinton	R	10.18	4.12	14.30					11.44
1489	Royster, F. S. Guano Co., Norfolk, Va.	Royster's 14 per cent Acid Phosphate.	Marshville	S	5.95	8.40	14.35					11.48
1210	do	do	Aulander	S	8.97	5.02	13.99					11.19
1230	do	do	Roper	S	8.25	5.47	13.72					10.98

N, D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1901—Continued.

Laboratory No.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100. Water-Soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-Soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Potash.	Relative Value Per Ton at Factory.
	RAW OR UNMIXED FERTILIZER MATERIALS.											
	Brands claiming						14.00					$11.20
1485	Southern Chem. Co., Winston, N.C.	Red Cross Acid Phosphate	Concord	R	9.28	4.82	14.10					11.28
1558	do	do	Walnut Cove	D	11.00	4.34	15.34					12.27
1256	Va.-Car. Chem. Co., Richmond, Va	Allison & Addison's Fulton Acid Phosphate.	Edenton	D	11.92	2.76	14.68					11.74
1306	do	Excelsior Dissolved Bone	Belcross	D	12.68	1.83	14.51					11.61
1392	do	do	Burlington	R	9.65	4.18	13.83					11.06
1548	do	Owl Brand Acid Phosphate	Raleigh	D	8.98	8.37	17.35					13.88
1344	do	do	Peachland	R	11.20	1.76	12.96					10.37
1427	Va.-Car. Chemical Co., Richmond, Va.	Tinsley's Powhatan High Grade Phosphate.	Edenton	D	12.18	2.51	14.69					11.75
1291	do	do	Rockingham	D	11.02	2.82	13.84					11.07
1547	do	Traver's Dissolved Bone Phosphate.	Raleigh	R	10.30	3.77	14.07					11.26
1253	do	do	Powellsville	D	9.60	3.62	13.22					10.58
1255	do	Valley of Virginia Bone Phosphate.	Edenton	R	11.60	3.39	14.99					11.99
1501	do	V.-C. C. Co.'s. Guaranteed 14 Per Cent Acid Phosphate.	Kinston	R	8.90	6.19	15.09					12.07
1535	do	do	Charlotte	D	12.15	2.98	15.13					12.10
1640	Va. State Fertilizer Co, Lynchburg, Va.	Gilt Edge Brand Acid Phosphate.	Davidson	R	10.10	4.47	14.57					11.66
	Brand claiming						15.00					12.00
1356	Charlotte Oil and Fert. Co., Charlotte, N. C	Charlotte 15 Per Cent Acid Phosphate.	Franklinton	D	11.02	3.04	14.06					11.25
	Brands claiming						16.00					12.80
1651	Atlantic Chemical Co., Norfolk, Va.	Atlantic 16 Per Cent Acid Phosphate.	Statesville	R	11.10	4.66	15.76					12.61
1486	Southern Chemical Co., Winston, N. C.	Comet 16 Per Cent Acid Phosphate.	Concord	R	14.60	3.17	17.77					14.22
1664	Royster, F. S. Guano Co., Norfolk, Va.	Royster's 16 per Cent Acid Phosphate.	Littleton	D	10.50	6.14	16.64					13.31
	Brands claiming										12.00	12.00
1453	Acme Manufacturing Co., Wilmington, N. C.	Pure German Kainit	Greensboro	R							12.10	12.10

1138	American Fert. Co., Norfolk, Va	Genuine German Kainit	Plymouth	S							12.30	12.30
1491	do	do	Marshville	S							12.98	12.98
1503	do	do	NewBern	S							12.34	12.34
1536	Ashepoo Fert. Co., Charleston, S. C.	German Kainit	Charlotte	S							12.36	12.36
1309	Atlantic Chem. Co., Norfolk, Va	Genuine German Kainit	Edenton	S							12.04	12.04
1492	do	do	Marshville	S							12.16	12.16
1310	Baugh & Sons Co, Norfolk, Va	do	Winfall	B							12.52	12.52
1245	Calder Bros., Wilmington, N. C	do	Maxton	D							12.18	12.18
1537	Calder Bros., Wilmington, N. C	do	Charlotte	R							12.50	12.50
1381	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	do	Raleigh	S							13.44	13.44
1220	Columbia Guano Co, Norfolk, Va	do	Gatesville	S							12.76	12.76
1175	do	do	Kinston	S							12.96	12.96
1655	Cowell, Swan & McCotter Co., Bayboro, N. C.	do	Bayboro	B							14.76	14.76
1488	Hardison & Co., Wadesboro, N. C	do	Wadesboro	R							12.52	12.52
1595	Imperial Co., Norfolk, Va	do	Edenton	S							15.16	15.16
1631	Lazaretto Guano Co., Baltimore, Md.	do	Elizabeth City	R							12.42	12.42
1128	Meadows, E. H & J. A., Co., New-Bern, N. C.	do	Kinston	B							13.66	13.66
1176	Navassa Guano Co., Wilmington, N. C.	do	Kinston	R							12.60	12.60
1642	Norwood, G. A., Jr., Goldsboro, N. C.	Pure German Kainit	Wilmington	S							12.00	12.00
1440	Patapsco Guano Co., Baltimore, Md.	Genuine German Kainit	Edenton	R							13.38	13.38
1131	Pocomoke Guano Co., Norfolk, Va	do	Kinston	S							12.16	12.16
1358	Richmond Guano Co., Richmond, Va.	Pure German Kainit	Franklinton	S							12.56	12.56
1418	do	do	Belmont	R							11.48	11.48
1570	Rocky Mount Oil and Fertilizer Works, Rocky Mount, N. C.	Imported German Kainit	Rocky Mount	S							12.28	12.28
1419	Southern Chemical Co., Winston, N. C.	do	Lowell	S							12.26	12.26
1296	Va.-Car. Chem. Co, Richmond, Va.	Genuine German Kainit	Lilesville	S							12.82	12.82
1219	do	do	Plymouth	R							12.64	12.64
1538	do	do	Charlotte	S							12.86	12.86
1130	Weil, H. & Bro., Goldsboro, N. C	do	Kinston	R							12.84	12.84
	Brands claiming										50.00	50.00
1490	Baugh & Sons Co., Norfolk, Va	Muriate of Potash	Wadesboro	R							50.76	50.76
1632	do	Sulphate of Potash	Elizabeth City	D							47.64	47.64
	Brand claiming										2.00	2.00
1665	Lee, A. S., & Son, Richmond, Va	Lee's Prepared Agricultural Lime.	Battleboro	R							2.37	2.37
1455	Ward, S. H. & Sons, Jamestown, N. C.	Pure Bone Meal	Greensboro	S					4.37	4.37		*23.24

N, D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse. P—damp; Y—lumpy; W—wet.

ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1901—Continued.

Laboratory No.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100. Water-Soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-Soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Potash.	Relative Value Per Ton at Factory.
	RAW OR UNMIXED FERTILIZER MATERIAL.											
	Brands claiming									3.50		
1454	Wilson, Eli, D. C	Pure Bone Meal	Greensboro	B					4.64	4.64		†$26.94
	Brands claiming									10.00		28.00
1666	Baugh & Sons Co., Norfolk, Va	Fine Ground Fish	Chadbourne	R				.74	9.34	10.08		28.22
1667	do	do	Chadbourne	S				1.06	9.01	10.10		28.28
	Brands claiming									18.00		50.40
1612	Ashepoo Fertilizer Co., Charleston, S. C.	Nitrate of Soda	John's Station	B						19.04		53.31
	Brand claiming									18.50		51.80
1674	Va.-Car. Chem. Co, Richmond, Va	Nitrate of Soda	Smithfield	R						19.04		53.31
	Brand claiming									19.00		53.20
1633	Baugh & Sons Co., Norfolk, Va	Nitrate of Soda	Raleigh	B						19.06		53.37

N, D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

*Total Phosphoric Acid found, 18.50 per cent, valued in bone meal at three cents per pound.
† Total Phosphoric Acid found, 19.92 per cent.

COMPOSITION OF FERTILIZERS FOR SPECIAL CROPS.

To obtain for our own benefit and to convey to the users of fertilizers some idea of the composition, as well as the variation in composition, of fertilizers sold in the State for special crops, we have brought together in the tables following data relating to cotton, corn, tobacco, truck, cabbage, strawberry, wheat and potato fertilizers. In these tables will be found the number of brands registered for each of the crops referred to above, the number of brands analyzed, the smallest per cent each of available phosphoric acid, ammonia and potash in any of the brands, the largest amount of the same constituent in any of the brands, and the average amounts in all of them as guaranteed by the manufacturers. To compare with this data the results obtained in the analyses of the several brands are included under the heading, "Per Cent Found."

These facts should be of very great interest to the users of fertilizers. They do not show—not even the averages—what is the best fertilizer for each particular crop, but they do emphasize the wide variation in composition of fertilizers made by different or even the same manufacturers for the same crop—and often for use on the same kind of soil. This is well illustrated by the data relating to the guaranteed composition of fertilizers for tobacco, as follows:

	Lowest Per Cent.	Highest Per cent.	Average Per cent.
Available phosphoric acid	5.00	9.25	8.12
Ammonia	2.00	10.00	2.73
Potash	1.00	5.00	2.64

The use of fertilizers with such widely varying amounts of phosphoric acid, ammonia, and potash on the same crops and soils should cause farmers to think as to whether or not their practice is such as to give them the best results in crop yields. The paper in another part of this *Bulletin*, on "The Systematic Investigation of Soils," with a view to determining the fertilizers best suited to different crops and soils will be found of interest in this connection.

GUARANTEED AND FOUND COMPOSITION OF SPECIAL FERTILIZERS FOR TOBACCO, SOLD IN NORTH CAROLINA IN 1901.

	Number of Brands Registered for Sale.	Number of Samples Analyzed.	Per Cent Guaranteed.			Per Cent Found.			Average Per Cent of Samples Found Above the Guarantee.
			Lowest.	Highest.	Average.	Lowest.	Highest.	Average.	
	108	96							
Water-Soluble Phosphoric Acid						2.95	8.55	6.19	
Reverted Phosphoric Acid						1.41	7.69	2.86	
Available Phosphoric Acid			5.00	9.25	8.12	7.44	11.77	9.18	90.70
Water-Soluble Ammonia*						.06	1.55	.94	
Organic Ammonia						.61	3.40	1.68	
Total Ammonia			2.00	10.00	2.73	1.63	4.95	2.75	66.30
Potash			1.00	5.00	2.64	1.07	5.82	2.87	83.84

* This represents mainly the Ammonia in Nitrate of Soda and Sulphate of Ammonia.

GUARANTEED AND FOUND COMPOSITION OF SPECIAL FERTILIZERS FOR COTTON, SOLD IN NORTH CAROLINA IN 1901.

	36	28							
Water-Soluble Phosphoric Acid						2.95	8.42	5.91	
Reverted Phosphoric Acid						.80	4.90	2.88	
Available Phosphoric Acid			8.00	9.00	8.17	7.53	10.94	8.80	92.30
Water-Soluble Ammonia *						.15	1.32	.60	
Organic Ammonia						.75	2.67	1.78	
Total Ammonia			2.00	3.00	2.25	2.00	2.82	2.28	100
Potash			1.00	4.00	1.87	1.00	4.24	1.99	97

* This represents mainly the Ammonia in Nitrate of Soda and Sulphate of Ammonia.

GUARANTEED AND FOUND COMPOSITION OF SPECIAL FERTILIZERS FOR CORN, SOLD IN NORTH CAROLINA IN 1901.

	Number of Brands Registered for Sale.	Number of Samples Analyzed.	Per Cent Guaranteed. Lowest.	Per Cent Guaranteed. Highest.	Per Cent Guaranteed. Average.	Per Cent Found. Lowest.	Per Cent Found. Highest.	Per Cent Found. Average.	Average Per Cent of Samples Found Above the Guarantee.
	11	10							
Water-Soluble Phosphoric Acid						3.78	9.38	6.73	
Reverted Phosphoric Acid						1.86	7.03	3.23	
Available Phosphoric Acid			8.00	10.00	8.68	8.09	12.25	9.98	100
Water-Soluble Ammonia *						.29	.84	.54	
Organic Ammonia						1.27	2.48	1.69	
Total Ammonia			2.00	3.00	2.25	2.02	2.77	2.24	100
Potash			1.00	3.00	1.96	1.20	2.56	1.72	70

* This represents mainly the Ammonia in Nitrate of Soda and Sulphate of Ammonia.

GUARANTEED AND FOUND COMPOSITION OF SPECIAL FERTILIZERS FOR WHEAT, SOLD IN NORTH CAROLINA IN 1901.

	Number of Brands Registered for Sale.	Number of Samples Analyzed.	Per Cent Guaranteed. Lowest.	Per Cent Guaranteed. Highest.	Per Cent Guaranteed. Average.	Per Cent Found. Lowest.	Per Cent Found. Highest.	Per Cent Found. Average.	Average Per Cent of Samples Found Above the Guarantee.
	15	5							
Water-Soluble Phosphoric Acid						2.63	9.38	6.30	
Reverted Phosphoric Acid						2.45	7.99	4.86	
Available Phosphoric Acid			8.00	11.00	9.57	10.62	12.25	11.19	100
Water-Soluble Ammonia *									
Organic Ammonia									
Total Ammonia			2.00	6.00	3.25				
Potash			1.00	8.00	2.45	1.30	1.81	1.56	20.00

* This represents mainly the Ammonia in Nitrate of Soda and Sulphate of Ammonia.

GUARANTEED AND FOUND COMPOSITION OF SPECIAL FERTILIZERS FOR POTATOES,

SOLD IN NORTH CAROLINA IN 1901.

	Number of Brands Registered for Sale.	Number of Samples Analyzed.	Per Cent Guaranteed.			Per Cent Found.			Average Per Cent of Samples Found Above the Guarantee.
			Lowest.	Highest.	Average.	Lowest.	Highest.	Average.	
	20	11							
Water-Soluble Phosphoric Acid						3.72	6.85	4.96	
Reverted Phosphoric Acid						.92	3.75	2.64	
Available Phosphoric Acid			2.00	8.00	6.45	6.55	9.20	7.60	100
Water-Soluble Ammonia*						.12	5.43	2.61	
Organic Ammonia						1.10	3.59	2.44	
Total Ammonia			2.00	7 00	5.05	2.66	7.18	5.08	72.72
Potash			3.00	8.00	5.80	3.46	8.76	5.86	82.00

*This represents mainly the Ammonia in Nitrate of Soda and Sulphate of Ammonia.

GUARANTEED AND FOUND COMPOSITION OF SPECIAL FERTILIZERS FOR CABBAGE,

SOLD IN NORTH CAROLINA IN 1901.

	5	5							
Water-Soluble Phosphoric Acid						3.92	6.18	4.55	
Reverted Phosphoric Acid						1.97	3.36	2.75	
Available Phosphoric Acid			5.00	10.00	6.80	6.93	9.22	7.70	60.00
Water-Soluble Ammonia*						3.17	5.49	4.69	
Organic Ammonia						1.48	3.01	2.19	
Total Ammonia			7 00	10.00	8.00	6.18	7.27	6.89	50.00
Potash			2.50	7.00	4.50	5.17	8.18	6.66	100.00

* This represents mainly the Ammonia in Nitrate of Soda and Sulphate of Ammonia.

GUARANTEED AND FOUND COMPOSITION OF SPECIAL FERTILIZERS FOR STRAWBERRIES,

SOLD IN NORTH CAROLINA IN 1901.

	Number of Brands Registered for Sale.	Number of Brands Analyzed.	Per Cent Guaranteed.			Per Cent Found.			Average Per Cent of Samples Found Above the Guarantee.
			Lowest.	Highest.	Average.	Lowest.	Highest.	Average.	
	3	1							
Water-Soluble Phosphoric Acid							4.65		
Reverted Phosphoric Acid							1.88		
Available Phosphoric Acid			6.00	9.00	7.66		6.33		100
Water-Soluble Ammonia *							2.58		
Organic Ammonia							1.27		
Total Ammonia			2.50	4.00	3.33		3.85		100
Potash			4.00	9.00	5.66		4.21		100

* This represents mainly the Ammonia in Nitrate of Soda and Sulphate of Ammonia.

GUARANTEED AND FOUND COMPOSITION OF SPECIAL FERTILIZERS FOR TRUCK,

SOLD IN NORTH CAROLINA IN 1901.

	Number of Brands Registered for Sale.	Number of Brands Analyzed.	Per Cent Guaranteed. Lowest.	Per Cent Guaranteed. Highest.	Per Cent Guaranteed. Average.	Per Cent Found. Lowest.	Per Cent Found. Highest.	Per Cent Found. Average.	Average Per Cent of Samples Found Above the Guarantee.
	32	11							
Water-Soluble Phosphoric Acid						2.52	6.83	5.40	
Reverted Phosphoric Acid						1.75	4.03	2.45	
Available Phosphoric Acid			2.00	10.00	6.69	6.55	9.24	7.76	91.00
Water Soluble Ammonia *						1.73	5.08	2.87	
Organic Ammonia						1.41	7.53	2.81	
Total Ammonia			4.00	10.00	6.16	4.10	9.69	5.72	36.36
Potash			2.50	9.00	4.99	3.36	8.61	5.60	91.00

* This represents mainly the Ammonia in Nitrate of Soda and Sulphate of Ammonia.

SOME CHANGES IN THE FERTILIZER LAW.

The recent Legislature made some changes in the fertilizer law. One of these is of interest in connection with fertilizer analyses. The former law required that no fertilizer should be sold in the State which contained less than 8 per cent of available phosphoric acid, 2 per cent of ammonia, and 1 per cent of potash. This provision was changed so as to allow more freedom in making mixtures to meet the crop and soil requirements of the different sections of the State, and is as follows:

"It shall be unlawful to sell or offer for sale fertilizers and fertilizing material not coming up to the following minimum requirement: (1) Any complete fertilizer containing phosphoric acid, ammonia, and potash, when the sum of the available phosphoric acid, ammonia and potash do not amount to 11 per centum in the aggregate; (2) any fertilizer containing phosphoric acid and potash when the sum of the available phosphoric acid and potash do not amount to 10 per centum; (3) any fertilizer containing phosphoric acid and ammonia, when the available phosphoric acid and ammonia do not amount to 10 per centum; (4) any fertilizer containing ammonia and potash, when the sum of ammonia and potash do not amount to 10 per centum; (5) any acid phosphate which contains less than 10 per centum of available phosphoric acid. No mixed fertilizer of any kind shall be sold which contains less than 2 per centum of ammonia or one per centum of potash, or both, where they are claimed in the same fertilizer."

This allows the available phosphoric acid to be decreased, provided the potash or ammonia, or both, are correspondingly increased, or vice versa.

THE SYSTEMATIC INVESTIGATION OF SOILS.

B. W. KILGORE.

The strength and influence of an organization is measured perhaps as much by the customs it establishes as by the duties performed under compulsion of regulations and by-laws. Custom, though of but few years standing in the present instance, directs that the presiding officer of the section shall present some remarks on the subject of his choosing at the time of vacating the chair. Last year we had the pleasure of listening to the most excellent paper of the presiding officer on the subject of "Chemical Economics," in which the importance and influence of chemistry in transforming the minerals and ores of the earth and the agricultural products of the soil into the necessities, comforts, and luxuries of life were admirably set forth. Closely related to manufactures and to the finished products of the mill and the factory is agriculture, which furnishes the raw products for the great modern industries, necessitates the development of methods and processes, and the employment

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Address delivered before the North Carolina Section of the American Chemical Society, at Raleigh, on April 27, 1901.

of knowledge, skill and industry. "Perfect agriculture," as the great Liebig, more than sixty years ago comprehended it, "is the true foundation of all trade and industry; but a rational system of agriculture can not be formed without the application of scientific principles, for such a system must be based on an exact acquaintance with the means of nutrition of vegetables and with the influence of soils and actions of manures upon them; this knowledge we must seek from chemistry, which teaches the mode of investigating the composition and studying the character of the different substances from which plants derive their nourishment." This was Liebig's idea of the relation of chemistry to agriculture.

A thorough understanding of the soil is the basis of the best agricultural practice, and I ask your consideration of some thoughts relating to "Systematic Soil Investigations" as the means of obtaining this essential and thorough knowledge of agricultural lands.

To Sir Humphry Davy is credit more largely due than to anyone else for early knowledge as to the composition of soils and plants. It is interesting to note some of the ideas held by him as presented in his lectures before the Royal Agricultural Society of England in 1802. The substances of the soil "are certain compounds of the earths, silica, lime, alumina, magnesia, and of the exides of iron and magnesium; animal and vegetable matters in a decomposing state." "The ashes of plants contain some of the earths of the soil in which they grow, but these earths * * * never equal more than one-fiftieth of the weight of the plant. * * * If they be considered as necessary to the vegetables, it is as giving hardness and firmness to their organization. Thus, it may be mentioned, that wheat, oats, and many other hollow grasses, have an epidermis principally of the silicious earths, the use of which seems to be to strengthen them and defend them from the attacks of insects and parasitical plants."

On the subject of the food of plants, Sir Humphry says: "Water and the decomposing animal and vegetable matter existing in the soil constitutes the true nourishment of plants, and as the earthly parts of the soil are useful in retaining water, so as to supply it in the proper proportions to the roots of the vegetables, so they are likewise efficacious in producing the proper distribution of the animal and vegetable matter; when equally mixed with it they prevent it from decomposing too rapidly, and by this means the soluble parts are supplied in proper proportions."

He considered sugar and other soluble vegetable and animal substances, in the fresh as well as partially decomposed state, as humus, as plant food, in fact, the main source of plant food, and did not understand the use or value of mineral matters in plant growth, as is indicated by the following sentence: "The alkaline sulphates and the earthy muriates are seldom found in plants, or, are found in such minute quantities that it can never be an object to apply them to the soil." Silica was considered of more importance to plants than potash, phosphoric acid and lime. Notwithstanding these errors, as we now know them to be, we are greatly indebted to Davy for preparing the way for the application of the science of chemistry to the solution of agricultural problems.

It was not, however, till the master mind of Liebig was directed to ques-

tions of plant nutrition that the real dawn came to agricultural chemistry. The appearance, in 1840, of his work on "Chemistry in its Application to Agriculture and Physiology" brought about almost a complete change in the then existing theories and ideas of plant food and plant nutrition, though his views were not accepted without stubborn resistance from the believers in the theory of Davy, von Thaer, Schulze and others, that the organic matter of plants comes entirely from the humus and other organic matter in the soil. There is now no one to uphold this theory, and the contention of Liebig that the elements of the carbohydrates of plants come from the air and water reigns without a disputer to its claims. Liebig also showed the importance and relations of the mineral constituents of the soil and of fertilizers to plant growth as elaborated in his mineral theory of plant nutrition. His investigations are the basis of the present tremendous fertilizer industry, and it would appear from a letter written to American farmers, through the Commissioner of Patents of the United States in 1845, that Liebig saw with wonderfully clear vision the coming of this industry. "Manufactories of manures," says he, "will be established, in which the farmer can obtain the most efficacious manure for all varieties of soils and plants. Then no artificial manure will be sold whose exact amount of efficacious elements is not known, and this amount will be the scale for determining its value. Instead of the uncertainty of mere empiricism, all the operations of agriculture will be carried on with certainty, and instead of awaiting the results of our labors with anxiety and doubt, our minds will be filled with patience and confidence."*

Thus, fifty-six years ago the fertilizer business was forecasted and our present method of valuing artificial manures was outlined. The other and more essential part of the prophecy—that relating to the certainty that would attend agricultural operations under the newly-discovered principles of plant nutrition—has not been fully verified by after experience. Liebig had shown the predominant influence of the mineral elements in the development of plants by growing them under such conditions and with such applications of mineral substances as indicated their value in plant nutrition, and then analyzed the plants themselves, to see not only what, but also the amounts, of the different substances that had been taken up. In writing the above prophecy he doubtless had in mind, in view of his experimental results, that all that was necessary to bring about "perfect agriculture," as he expressed it, was to analyze the plant and ascertain just what it required for the best development and then analyze the soil and supply to the plant in artificial manure what it needed beyond what the soil contained.

This was a natural assumption and one calculated to take one off his feet, especially in the light of such magnificent achievements. But this hope of Liebig and his followers was not to be realized, and the advocates of the analysis of plants and soils as the sole and only necessary means of determining the fertilizers to be applied to different crops and soils for the best results brought upon the agricultural chemist much trouble, and, in many cases, distrust and disrepute.

Some of the early happenings in the history of agricultural chemistry have thus been recounted to show the origin and development of soil analysis

* Year Book U. S. Dept. Agr. for 1899, p. 223.

and to more clearly indicate why soil analysis has not been altogether popular. Liebig's masterful investigations demonstrated the true requirements of plants and showed the composition of the soil, but he claimed too much for soil analysis, and after-workers have had to explain why his claims are not true, as well as to carry on studies in the usual direction of obtaining positive results. Besides having an extremely difficult problem on his hands, the soil man has had to perform double duty—to explain why something is not so and to develop methods that will make it so. The practical agriculturist, in many cases, has done much to retard and discourage the labors of his co-worker and "friend of the retort and crucible," by attempting to interpret too literally the results of the chemist and then condemning them as unreliable and even worthless, because they do not meet expectations. This would not be so bad if something better were offered as a substitute, but such has not been the case, and the chemist has had to continue his work in the hope of reaching a solution of practical value. On the other hand, it is perfectly true that a tremendous number of soil analyses are only fit for the garret or to show how and where failures have been made and thus prevent a repetition of such work.

Failures are generally necessary to point the way to success, and I am glad to say that a survey of the field of soil work to-day reveals more encouraging features than ever before existed in this line of endeavor. Of special interest and bearing on this point is the following extract (Experiment Station Record, 12, 8, 702), from a review of a recent report of more than twenty years' systematic soil investigations in Russia:

"Turning from a consideration of the system followed to the results accomplished, we find that the work of soil investigation in Russia has been prosecuted with such vigor and thoroughness that not only has Professor Sibirtzey been able to give in a recent report a soil map showing in colors the areas occupied by the principal types of soils of European Russia (about 22), but also a very complete characterization of these soils, including their origin and history, topographic features, vegetation, climatic conditions, relation to moisture, physical and chemical properties, and behavior under culture. * * * As a comprehensive, systematic and thorough piece of work which has been fruitful of remarkable results, these Russian soil investigations are worthy of the careful study of all interested in the subject. They should be of especial interest to American investigators, since the soil conditions of Russia are, to a considerable extent, duplicated on this continent, a fact which has been recognized by Hilgard and others, particularly in the study of the virgin soils of America."

In our own country system and uniformity of methods have entered into soil investigations, and results of great value are being recorded. Too much credit can not be given to the labors of Dr. Hilgard, which have been so effective in bringing about this favorable state of affairs. In 1860 he published his report on the Geology and Agriculture of Mississippi, and for more than forty years he has not only been a strong advocate of the chemical and physical examination of soils, but has been our most active worker in this field. His methods or rules for interpreting soil analyses have been widely copied, but he insisted that not only should the chemical and physical data of the examination be considered, but that the climatic, culture, and vegetation conditions should also be taken into account. In the Tenth Census he uses this language:

"A soil naturally timbered with a large proportion of walnut, wild cherry, or, at the South, with the poplar or tulip trees, is at once selected as sure to be both productive and durable, especially if the trees are large. He (the farmer) knows well that the black and Spanish oaks frequent only 'strong' soils, and that the admixture of hickory is a welcome addition, while the occurrence of the scarlet oak at once lowers the land in his estimation, and that of the pine still more so. However much opposed to the cocklebur in his fields, he welcomes it as a sure sign of a good cotton soil, as much as though he had seen the latter itself growing for a series of years. * * * Taking for granted the soundness of the principle involved in judging the productiveness and the peculiarities of soils from their natural vegetation, and having gained a large array of additional data from personal observation in the field, I have then sought to ascertain by close chemical and physical examination of the soils in their natural condition the causes that determined this natural selection on the part of certain species of trees and herbaceous plants, while at the same time observing closely the behaviour of such soils under cultivation, their special adaptation," etc.

For a number of years his work on the soils of Mississippi was productive of but little good, but it must be a source of great gratification to him in his advancing years to know that the wark has been taken up anew, his old classification adopted as the basis of operation, large numbers of samples collected from the several areas, and examined physically and chemically; and the results compared with actual trials with crops and fertilizers in the field, though the amount of the latter work thus far has been rather small. From a report on the "Soils of Mississippi: Plant Food and Productiveness*," issued in February of this year, I take the following statements, which are full of significance and of great magnitude to the farmers of that State:

"Except on spongy reed-brake soils, consisting largely of organic matter, the application of lime has not helped any crop on any soil in this State."

Considerable areas need phosphoric acid.

"Nitrogenous fertilizers increase the yields of most of the soils in the State, and where nitrogen is added by growing cow-peas, velvet beans, vetch and melilotus, which also adds organic matter to a soil and improves its texture, results of the most satisfactory kind are obtained.

"The supply of potash seems to be ample everywhere in the State, and we have no evidence that any of our soils require the use of fertilizers containing potash to increase the yields. The results do not indicate the minimum amount of potash in the soil that is adequate for good crops.

"We have not found a cultivated soil, which analysis showed to be rich in plant food that was not productive if other essential conditions were good."

It is interesting to note that the analyses of the Mississippi soils show those from the "brown loam" region to contain four to five times as much potash as phosphoric acid, and the sandy soils of the pine-woods section have three to five times more potash than phosphoric acid. The field experience of farmers and a limited amount of experimental evidence are in accord with the analytical results in showing that potash is not needed by these

* Miss. Expt. Sta., Bul. No. 66.

soils, especially the sandy soils of the coastal plain, for the production of ordinary crops, but phosphoric acid generally increases the product very materially

In Louisiana a great deal of experimental work, mostly actual tests in the field, has been carried out to determine the fertilizer requirements of different crops and soils. As a general result of these investigations, Dr. Stubbs says the crying need of Louisiana soils is for phosphoric acid. The upland and worn soils, of course, need nitrogen, but potash is the least effective in crop production of any of the three valuable constituents of fertilizers. This State has taken up in the last two or three years the analytical side of soil work and is classifying and grouping, mainly in co-operation with the Division of Soils of the United States Department of Agriculture, its soils and making chemical and physical analyses of the soils of the various areas. This investigation will no doubt throw much light on, strengthen and make more largely applicable the valuable results already obtained in Louisiana. Because of the proximity of Mississippi, Louisiana and Alabama and the similarity of considerable portions of their soils, it is interesting to note some results obtained by Prof. Duggar, of the Alabama Experiment Station,* in tests continued on the same land for two and three years to determine the fertilizers best suited to cotton and corn. On sandy land, with and without clay subsoil, nine tests with cotton showed nitrogen to be the most needed constituent, phosphoric acid being second, while potash was of but little value, though more effective on this class of land than on mulatto or more clayey soil. In three years' experiments neither phosphoric acid nor potash increased the yield of corn, though nitrogen was very beneficial. On reddish clay or mulatto soil, of which there is considerable around Raleigh, in seven tests, covering three years, with cotton, phosphoric acid was the most effective constituent of the fertilizer application, nitrogen being next, while potash was of but little benefit to cotton on this soil.

Bearing upon and in line with the experiences already discussed, is the following extract from a Bulletin of the New York (Geneva) Experiment Station,** issued in December, 1900, summarizing the results of four years' tests with Irish potatoes on four widely separated farms on the sandy soils of Long Island:

"In 1898, the first year, when the yield of potatoes was fairly large, the entire absence of potash from the fertilizer was without influence on any one of the four farms. Forty pounds of nitrogen and eighty pounds of phosphoric acid per acre without potash caused as large an increase of tubers as when accompanied by one hundred pounds of potash. In the two succeeding years, while the crops were small on all plats, potash either in small or large proportions had little effect. It must be conceded that up to the point to which these experiments have been carried on, nitrogen and phosphoric acid, one or both, were the ingredients upon which dependence could be placed as a source of profit.

"Experimental results no more extensive than those herewith reported should not be taken as justifying the exclusion of potash from commercial fertilizers. This is, in any case, a local question. There are good reasons for enquiring, however, whether, considering the capacity of our soils and in

* Buls. 111 and 113. ** Bul. 187.

view of considerable experimental data, the importance of potash salts has not been somewhat over-estimated by Long Island potato growers. * * *

"It is well worth much time and careful observation to discover the needs of a soil upon which commercial fertilizers are to be continuously used. The outcome of extensive experiments for four years on four farms presents good reasons for questioning the wisdom, under the conditions involved, of applying more potash on potatoes than any other ingredient."

With the foregoing results, relating largely to sandy soils and indicating that potash is not specially needed on the particular ones referred to, in mind, we are led, to put it mildly, to think as to whether or not the prevailing opinion among the farmers in the eastern, or sandy soil, section of this State is correct, when they maintain that their soils are not specially in need of phosphoric acid, and that, aside from nitrogen, potash is the most needed and beneficial constituent of their fertilizers for all crops. This question appears all the more worthy of thought, when it is known that the farmers of North Carolina will pay this year for comercial fertilizers not less than $6,000,000, practically $2,500,000 being for phosphoric acid, $2,500,000 for nitrogen, and $1,000,000 for potash. If one of these constituents is not needed, or if used in greater proportion than necessary, it would mean a tremendous saving to the agriculture of the State, if reasonably positive proof of the fact could be given. The only reasonable way of obtaining such evidence is by a systematic investigation of the soils of the section or of the State and a determination of their adaptability to the plant food requirements of the crops grown or to be grown upon them. The importance and magnitude of the problem as measured by the expenditure for fertilizers, to say nothing of the greater profit that might come from increased crop production, justifies, if it does not indeed demand that such work be done.

The Division of Soils of the United States Department of Agriculture has, by the systematic and uniform methods adopted, greatly increased the efficiency and value of soil work. In co-operation with that Division of the National Government, the State Department of Agriculture made last year a soil survey of a strip of land eight miles wide—four miles on either side of the railroads—and extending from Raleigh to New Bern, embracing about 900 square miles, in the counties of Wake, Johnston, Wayne, Lenoir, Craven and Jones. In this work all of the soil of the area was gone over, and carefully examined by an experienced judge of soils, and wherever in the area surveyed the same soil was found it was indicated on accurately prepared maps by the same color. This map is now in course of preparation by the Division of Soils and will show, when out, the outlines and areas of the several soil types occurring between Raleigh and New Bern. At the time this work was done samples of virgin and cultivated soils were taken for chemical and physical examination. Fifty of these have been examined chemically in our laboratory, and the other 150 belonging to this area will be completed, we hope, during the summer. Nothing is being spared to make the analyses as complete and thorough as possible.

At present there are several parties engaged in surveying a 900 square mile section included mainly in the counties of Iredell, Davie and Rowan, with small strips of Mecklenburg, Lincoln and Catawba. Progress indicates that this area will be completed by July first, when the Eastern section will

be again entered and a considerable area, we hope, added to that examined there last year.

This is one phase of the soil work in which the Department of Agriculture is engaged. It does not, however, propose to depend entirely upon these field observations and on the chemical and physical analyses of the soils, but rather to make them the ground plan for classifying and grouping the soils of the State into type areas, with the view of conducting thorough and systematic fertilizer, culture, and other tests on the main soil areas—actually asking of the plants themselves on the particular soils what they need in the way of culture and fertilization to give the most profitable returns.

And you may be interested to know that this work is not merely outlined on paper, but is in actual operation. I have already indicated to you that the soil survey is proceeding with reasonable rapidity, and two "Test Farms" have been established on type areas in the east, on which experiments of the kind referred to were conducted last sason. While somewhat extended, the tests are being made again this year on exactly the same plan as last year, and it is hoped to continue the work in this way, taking advantage of such progress in methods as may come about, for a sufficiently long time to obtain valuable and reliable results, having in mind that it is better to confine investigation and experimentation to limited and well-defined plans where funds are not abundant, rather than try to cover at one time too much of the broad field of agriculture. Much good has already come from the work, and we hope it is only in the beginning and that we may be able to throw additional light from year to year on the fertilizer requirements, culture methods, and adaptability of plants now used and not now used to the different conditions and sections of the State. In this work we are earnestly endeavoring to thoroughly acquaint ourselves with the practice of farmers in the hope of bringing closer together art and science, and in making "science more practical and practice more scientific."

GROWTH OF THE NORTH CAROLINA TRUCKING INDUSTRY.

Few of our people have a proper conception of the importance—magnitude—or of the value and extent of the farming operations, commonly called "trucking," now being conducted in the great territory skirting the tide-water counties of this State. The industry is about twenty years old, and the march of progress has been not only constant, but at times strident. The conditions of both soil and climate are conducive in large measure to a proper and remunerative extension of this industry, as they were the conserving and fostering elements in its establishment and growth. The future of the industry is full of promise. The shipment of the early fruits and vegetables is the primary purpose of the farmer, but the canning of these crops, when the shipping is no longer profitable, is also beginning to engage the attention of these intelligent and successful planters. They, fortunately, are in position to establish and conduct these canneries independently, and can supply the highest grades of preserved foods at a minimum cost of production.

Only a partial report is in hand of the movement of "trucks" for last year. The region from Beaufort County northward has not been reported, and as

there are some thirty counties where trucking is being done, the returns hereinbelow presented must be understood as covering only a small part of the actual area under cultivation.

The East Carolina Truck and Fruit Growers' Association, through its business agent, Mr. H. T. Bauman, presents the following statement of shipments for last year:

VEGETABLES FROM WILMINGTON AND VICINITY.

Consisting of	Packages.	Consisting of	Packages.
Lettuce	27,276	Egg Plant	1,634
Beans	10,434	Peas	5,132
Cucumbers	1,351	Radishes	1,874
Cabbage	3,226	Beets	3,626
Tomatoes	2,289	Potatoes	1,597
Cantaloupes	6,906	Carrots	55
Green Corn	147	Asparagus	736
Squash	167	Turnips	45

Packages, 66,495; total pounds, 4,554,050.

CANTALOUPES.

From	Cars.	Crates.
Wilmington	10	2,675
Wallace	5	1,277
Warsaw	10	1,751
Faison	7	2,011
Mount Olive	12	2,938
New Bern	4	1,710
Total	48	12,504

DEWBERRIES.

From	Cars.	Crates.
Fayetteville	23	4,153

BEANS.

From	Cars.	Crates.
New Bern	6	2,446
Washington	2	324
Fayetteville	1	183
Faison	6	2,641
Goldsboro	26	11,847
Lake City	1	500
Mount Olive	1	424
Chadbourn	3	808
Rocky Mount	2	900
Whiteville	3	1,242
Wilmington	4	1,525
Total	55	22,840

STRAWBERRIES

From	Crates.	Pounds.
W. & W. R'y	294,106	14,705,300
W. C. & A. R'y	36,400	1,820,500
Fay. & A. Y. R'y	17,000	850,000
N. & W. R'y	2,473	123,650
Total	349,989	17,499,450

It required a grand total of 1,129 cars to transport this immense crop of strawberries. To show something of the growth of the berry crop during the past four years, the following figures are presented:

	1897.	1898.	1899.	1900.
Total quarts	5,254,016	8,449,680	9,233,664	11,044,064

From the New Bern region (and it will be observed that in the above only two items appear from that point, indicating, it is presumed, that but few of the growers there are in the association), Mr. Wm. Dunn, one of the most enterprising growers of that section, presents the following statistics for last year:

Potatoes, 187,061 barrels. Vegetables other than potatoes, 546,224 packages. This last item Mr. Dunn separates in this way:

Strawberries, 10,000 32 qt. crates; peas, 150,000 bushel baskets; beans, 110,000 bushel baskets; cabbage, 160,000 barrel crates; other vegetables, 116,224 packages.

The "other vegetables" referred to were turnips, beets, raddish, lettuce, asparagus, etc.

In addition to the truck shipments, Mr. Dunn supplies the following for the same year:

Lumber, 65,235,300 feet; shingles, 25,500,000; oysters, 100,000 bushels; fish, fresh, 60,000 pounds; cotton, 10,000 bales.

All of which is of interest as showing the value of the various products of the region.

THE SWEET POTATO.

By GERALD MCCARTHY, Biologist and Botanist N. C. Department of Agriculture.

The sweet potato is believed to be a native of the South American continent. It was first carried to Europe by Columbus.

Although no Southern home is without its sweet potato patch, the real value of this plant is still far from being appreciated by Southern farmers, both as a food for man and beast and as a money crop, capable of manifold uses, and consequently of an extensive demand.

Besides its value as a food the sweet potato can be profitably grown for manufacturing starch, glucose and alcohol, on the most extensive scale. The development of cotton manufacturing in the South has created a demand, and the future will enlarge this demand, for starch used in sizing yarns and filling cloth. At present every pound of this starch is brought from the Irish potato starch factories, of Maine, and the corn-starch factories of New York, Illinois, and other States. For use on cotton goods the starch produced by sweet potatoes is better than either corn or Irish potato starch.

The annual production of sweet potatoes in the South Atlantic and Gulf States is about sixty million bushels, but might be easily increased ten-fold. The average yield per acre is less than seventy-five bushels. The average for North Carolina is about eighty-five bushels. But maximum yields of over one thousand bushels per acre are on record. A fair crop of the better yielding varieties, such as the Georgia Yam, and Vineless, should not fall below 250 bushels per acre. With high cultivation an average of 350 bushels per acre is not uncommon.

The Southern taste demands a soft, syrupy potato, whereas the Northern palate demands a dry and mealy potato. It is, therefore, necessary to select the varieties most suitable for the purpose and market in view. As a rule the heaviest yielders are not of the best quality for the table.

The most esteemed soft and sugary potatoes for Southern market are the Creole or Sugar Yam, Georgia Yam, Bunch Yam, Tennessee Yam, Vineless and Hayman. For the Northern market the best varieties are Red Nansemond, Jersey, Early Caroline and Red Nose. For stock feed the best and heaviest yielders are Providence and Norton. For manufacture of starch probably the best varieties are Yellow Yam, Southern Queen, Tennessee and Norton.

All of the varieties of sweet potato are tender and must not be set in the field before the ground is well warmed. In the Carolinas form first to last of

May is the usual planting period. The potatoes recommended above for the Southern market are rather more hardy than those grown for the Northern market. Yet, for the Northern market, earliness is a very important factor as regards profit. It is, therefore, advisable to bed these under glass and set out early in May.

Sweet potatoes are always grown from "slips" or "sets" obtained by bedding the tubers. The steps or sets grow from eyes in the seed tubers, and are pulled when about ten inches long. A late crop of most varieties can be grown in North Carolina from cuttings of the vines of the early crop. The late crop is set out in July. Potatoes grown from vine cuttings are thought to keep better than those grown from slips.

The tubers used for bedding are usually the culls of the previous crop. Large, edible potatoes are sometimes used, but seem to give no better results than the small ones and cost a great deal more. A three-bushel barrel of small tubers will produce in two pullings about eight thousand usable slips. The best distance apart for sweet potato slips in field is 2 feet, in rows 3½ feet apart. The distance gives 7 square feet to each plant, and on fair soil has frequently produced over 300 bushels per acre, and more than similar plants set closer. To set one acre 2 by 3½ feet requires about six thousand plants. In bedding sweet potatoes the soil should be dug deeply and raked fine. Raise bed a few inches above surface. Lay the tubers on this bed one inch apart every way, cover with 6 inches of fine soil free from stones. One three-bushel barrel of small potatoes will require a bed containing about sixty-three square feet, or 3 by 21 feet. After bed is made a trench one foot deep should be dug around it with a drain to carry off surplus water. Sweet potatoes require a moist but not wet soil. In pulling slips from beds every slip should be carefully examined, and all showing black shanks or black rootlets should be discarded and destroyed. Such slips are diseased by the black rot fungus, *ceratocystis fim briata.* This disease is incurable in the field, and is liable to cause a disastrous loss by infecting the whole crop.

The best time to set out sweet potato slips is just before a rain. Just after a rain is not so good, as the soil is apt to puddle and cake around the roots. The crop should be given rapid and repeated cultivation from the time of setting out until the vines cover the ground. The best implement for cultivating sweet potatoes is the Planet, Jr., cultivator, with vine-lifting attachment. When this implement is used early and often no hand work or hoeing is required. The crop should be given flat cultivation, not ridged, as is the common custom. Flat culture usually increases the crop one-fourth or more over ridges. While the sweet potato will grow upon any warm, dry soil, it gives profitable yields only on soil containing humus and a fair amount of ready assimilable plant food, rich in phosphate and potash. Too much nitrogen is not good for this crop. The following formula can be recommended as very suitable for the sweet potato:

Acid phosphate, 14 per cent	1,000 pounds.
Sulphate or Muriate of Potash	400 pounds.
Cotton-seed meal	600 pounds.

Mix and use from 600 to 1,000 pounds per acre.

Sulphate of potash is better than the muriate for sweet potatoes. Kainit should never be used on this crop. It decreases the sugar content and injures the flavor. Most growers find it better to place the fertilizer under the drill rather than broadcast. When broadcasted the fertilizer causes too much rooting in the middles.

Sweet potatoes must be harvested before frost. The easiest and most economical way to harvest the crop is to cut off the vines with a sharp hoe. Then bar off the rows on both sides with a two-horse plow and throw out the potatoes with a third furrow. The potatoes should lie on the ground until well dried. In gathering all bruised potatoes should be placed by themselves, as they will not keep long. Potatoes intended for winter use should be handled as carefully as eggs. The best way to keep them when they can not be kiln dried, is to bed out doors in conical heaps of 10 bushels, covering with pine straw and earth, in the usual way. The earth covering must not be put on until after the potatoes have gone through the sweating process. Sweet potatoes improve in table quality, and very greatly increase their sugar contents, by being pitted for a month or two before eating.

The sweet potato would be more largely used if it were prepared in different ways so as to afford variety.

The following recipes have been tried and found very good:

SWEET POTATO PIE.

Boil and mash one pound of sweet potato, add 2 oz. butter, 2 beaten eggs, ½ pound of sugar, a little salt, the juice and grated rind of half a lemon and 1 glass of sweet milk. Bake as custard, on a single crust.

SWEET POTATO PONE.

Beat together a tablespoonful of butter and a cupful of brown sugar. Boil and mash 1 pound of sweet potato, add a cupful of milk, and stir in the sugar and butter. Add two well-beaten eggs, and season to taste with nutmeg and cinnamon or ginger. Bake in a well-buttered tin.

SWEET POTATO FRITTER.

Put into a sauce pan 1 pint of sweet milk, 1 pint of water, 1 tablespoonful of butter and a little salt. Bring to a boil and stir in 1 pint of flour and 1 pint of mashed sweet potato. Allow to cool below scalding heat, then stir in three well-beaten eggs. Have ready a pan of boiling lard. In this fry the fritters. Serve hot, with some kind of sauce.

SWEET POTATO RISSOLES.

Take 12 tablespoonfuls of mashed sweet potato; add salt, pepper and finely-chopped onion to taste. Beat separately the whites and yelks of 2 eggs. Chop finely some chicken meat, tongue or ham. Mix together the potato, meat and egg-yelks. Roll into small balls and cover with the white of eggs and bread crumbs. Cook in boiling lard. Drain on a sieve before the fire. Serve hot.

SWEET POTATO PUDDING.

Take 1 pound mashed sweet potato, ½ pound bread crumbs, 3 beaten eggs,

1 cupful of sugar, 1 dessert spoonful of powdered ginger, 1 pint of sweet milk. Put into a well-floured cloth or bag and boil one hour. Serve with sweet sauce.

INJURIOUS INSECTS.

FRANKLIN SHERMAN, JR., B. S. Agr., Entomologist.

The demand for information concerning insects, and means of combatting those that are injurious, has grown steadily since the writer has been in charge of the work. As to the importance of the work, we may quote from letters that we have recently received. One correspondent writes: "Last year my tobacco was materially damaged by flea-bugs, my cotton almost complete failure on account of lice, and my other crops damaged more or less by various kinds of insects. Without some means to combat the various pests to which our crops are subject, I feel that the farmer must succumb to complete failure. Would be glad to have advice from the Department as to best means of preventing and destroying these deadly enemies to our crops." Another sent in the following: "You are doing a good work, and I trust that your efforts to stamp out the pests injurious to our orchards and vineyards, in the State, may be crowned with success." Still another, who had been unconsciously fighting a case of San Jose Scale, wrote as follows: "Seeing a notice that the Agricultural Department desired to have specimens of injurious insects, I will send a twig, representing something killing my fruit trees. It appears like a scale, and is fatal when it attacks a tree. It appeared in my orchard four or five years ago, on some small trees, killing them. I have destroyed many trees, but it keeps on spreading. Any information that you can give me will be highly appreciated." Another letter from the same gentleman a little later, says: "Was very glad to hear from you concerning the San Jose Scale, as you decided it, which is injurying my orchard greatly. Would like very much for you to visit my place if possible when you are in this part of the State, and make some more investigations. As you say, it is a very serious matter and needs attention at once."

These quotations show not only the importance of the subject, but the practical value of the work that is being done. We wish to urge upon every farmer that this office is here for his use, and that we are glad to give our attention to any letters of inquiry concerning insects, spraying of trees, etc. New pests are coming to notice from time to time, and hence the need for constant watchfulness and painstaking investigation. The time has passed when a neglected tree can be reasonably expected to produce fruit of good quality, and the growing of first-class apples, peaches, pears and plums, in full crops, implies the use of cultivators, fertilizers, pruning shears, and a spray pump. Isolated trees in town or village lots may produce abundantly, but it is because their very isolation renders them less liable to the insects and diseases that ravage the orchards. The old, careless, happy-go-lucky method of fruit culture is now giving us its reward in an abundant harvest of enemies to combat.

In the great majority of cases where injurious insects are brought to our attention, the best remedy is to apply a spray in some form. Where such advice is given, it is often neglected, as the average farmer considers that the cost of a spray pump as far above the value that he would receive from its use. This is one of the popular errors with which the Entomologist has always to contend. Spraying is a practical remedy for most of the insect pests of our crops, and he who fails to apply the remedies in this manner fails in combatting these pests to the best advantage. We have found that in cases where we gave advice that was perfectly practical, the farmers neglected to apply the remedy suggested. It would be interesting to know how these same farmers expect their insect foes to decrease in number, while they thus neglect the methods that have been proven to be of use in their control. Each season that these pests are neglected provides for a greater number in the succeeding years. Local climatic conditions may temporarily decrease their numbers, but the general tendency in such cases is for them to increase. Surely every intelligent, observant farmer knows that insect pests are more numerous and troublesome now than they were formerly. Why, then, should the farmer neglect them when they appear in his crops? The writer insists that to the truckers, gardeners, and orchardists, a spray pump is a *necessity*, and we doubt if any operation gives a greater return for the labor and expense involved, than the proper application of properly made insecticides and fungicides, at the proper time.

Very little has been done in North Carolina in the matter of investigating these pests, which fact only emphasizes the need for farmers to make liberal use of this office now. The Entomologist can not go to each individual farmer and investigate the pests, and so we must have specimens in order to determine the trouble. We often receive letters asking about some insect, and the writer sends no specimens, and unless the insect be an exceptionally common one, we are not able to know with certainty what it is, and a satisfactory answer is impossible. Farmers should bear this in mind and always accompany an inquiry with specimens of the insect, and with samples of its injury when possible. Such specimens make valuable additions to our growing collection of the insects of the State. We wish, therefore, to impress upon the farmers, that this office is here for their benefit, and that we are glad to give our attention to any matters pertaining to insects that they may bring to our notice.

INSECTS THAT HAVE COME TO NOTICE.

In considering the insects that have come to our attention by observation and by correspondence with farmers, it has seemed best to separate them into groups according to the plants affected. We think that this will simplify matters for those who read this article. We have only given space to such as have actually come to notice, as doing appreciable damage in this State.

GARDEN INSECTS.

The HARLEQUIN CABBAGE BUG (*Murgantia histronica*) seems to have been very abundant and very destructive in the eastern part of the State during the past year, and it has already been reported to us this spring from Cleveland County. It is known by various names, such as "Calico-back," "Fire-

bug," and "Lincolnite," this last on account of the fact that it made its appearance at the time of Lincoln's administration. During last fall it was observed doing injury at Raleigh and Wilmington. This insect is illustrated in Fig. 1. If the reader will examine the enlarged figures, he will see that the under surface of one of these insects is represented. It will be noticed that instead of having jaws, it is provided with a long beak which is folded back

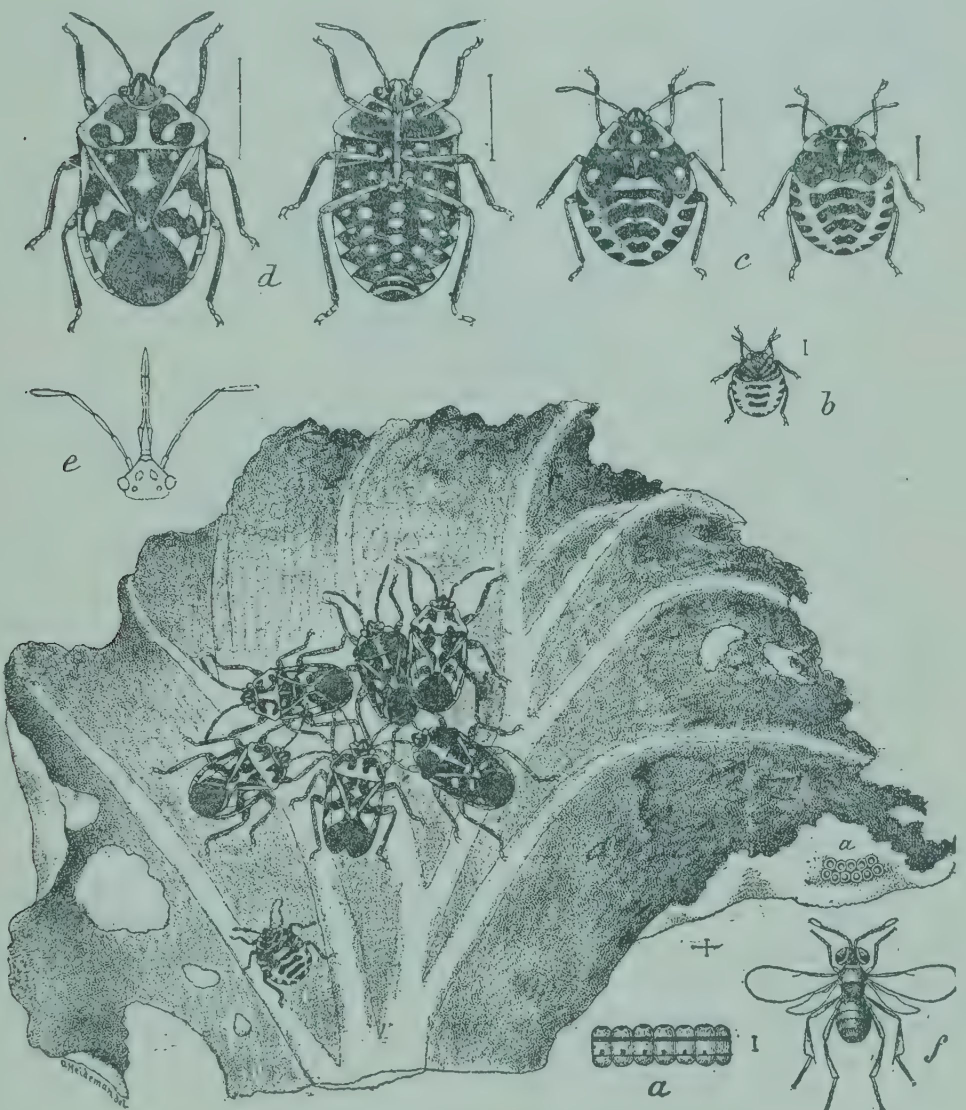


FIG. 1.—HARLEQUIN CABBAGE BUG.

a Eggs, enlarged; *b* young, enlarged; *c* young, more enlarged; *d* adults, dorsal and ventral views; *e* outline of head of adult; *f* parasite. Other figures natural size.

(From Entomologist, Md. Exp. Sta.)

between the legs. This is its regular position when not in use. The insect punctures the leaf with this beak, and sucks the sap. Owing to the structure of the beak, the insect can not eat the leaves in the manner that caterpillars do, but can only feed on the liquid which it draws from within the tissues of the plant. It is evident, therefore, that a poison, like Paris Green, which is placed on the leaf, could not be eaten, and hence would be of no value whatever as a remedy. Many insects take their food in this way, and with all such, poisons are of no avail. This fact shows the necessity of knowing the

structure and habits of an insect before we can be certain what remedy to apply. It will be seen from the figure that the main difference between the young and adult insects is that the young do not have well developed wings. At *f*, in the lower right-hand corner, will be seen a little four-winged insect that resembles a bee or wasp. This insect stings the egg of the Cabbage Bug, and lays its eggs inside of it. In this way the egg of the Cabbage Bug is killed. The little wasp-like insect is, therefore, a friend, and we speak of it as a *parasite*, because it derives its nourishment from another insect. This little parasite is so small that it would not attract the attention of the ordinary observer.

The Cabbage Bug is a native of Mexico or of Central America, and has only migrated northward in recent years. It is now known as a pest on Long Island and in Pennsylvania. As it is a native of the South it has some difficulty in passing through the cold winters, and in this State only the grown insects pass through this season. They hide under logs, boards, stones, and other rubbish, and remain in a dormant state as long as the cold weather lasts.

The female of the Cabbage Bug lays her eggs in a cluster, usually containing twelve eggs. These are gray, marked with black. They are represented in the figure. When ready to hatch the young bug escapes from the egg by breaking out one end of the shell.

As before mentioned, the young bug resembles the adult except that it is without wings, and all growth is accomplished while it is in the immature state. After the young acquire wings with which they can fly, they are adult, and make no further growth. This statement is true with regard to all insects. A small house-fly does not grow into a larger one, nor does a small potato bug grow into a larger one. After the mature stage is reached, all food taken serves only to sustain life and to store up energy for the reproduction of the species.

Remedies.—We have seen that poisons are of no use in this case, and if we fully understand why they are of no use, we have learned an important principle in economic entomology. A spray of kerosene emulsion would be well to kill them while they are very young, but if strong enough to kill the adults, it would also kill the plants. We are, therefore, compelled to employ some means to dodge the insects. The bugs do not fly about much as long as there is sufficient food in the fields where they are first hatched, hence if the farmer takes proper precautions, and subdues the bugs on his place, he is not likely to be seriously troubled with insects from other farms, especially if his cabbage field is isolated from other cabbage fields in the vicinity. In the early spring, the adult bugs may be found on seeding radish or kale plants, and if they are then destroyed by hand, it will greatly reduce the numbers that will come out later when the weather turns warmer. We found the bugs abundant in a garden at Durham on wild plants of the same family with the radish and cabbage, in the middle of April this spring, and a little remedial work at this time will do much toward lessening the numbers later in the season. In the early spring they are more *gregarious* than they are later in the season, by which we mean that they gather in colonies, instead of separating and

going to many different plants. This makes the work of their destruction at this time much more simple than it would otherwise be. Another very good way to get ahead of the bugs is to plant an early crop of mustard on the land where it is intended to plant the cabbage, and when ready to plant out the cabbage, go through the fields, and gather the mustard, bugs and all, and destroy them. A thorough spraying of the mustard plants with pure kerosene will destroy both the mustard and the bugs. In this case, of course, the mustard plants would be of no value.

The CABBAGE PLUSIA (*Plusia brassicae*), also did great damage last year. This insect while in the caterpillar stage, rags the leaves of the cabbage, often leaving nothing but the ribs of the leaves. It has been noted doing serious

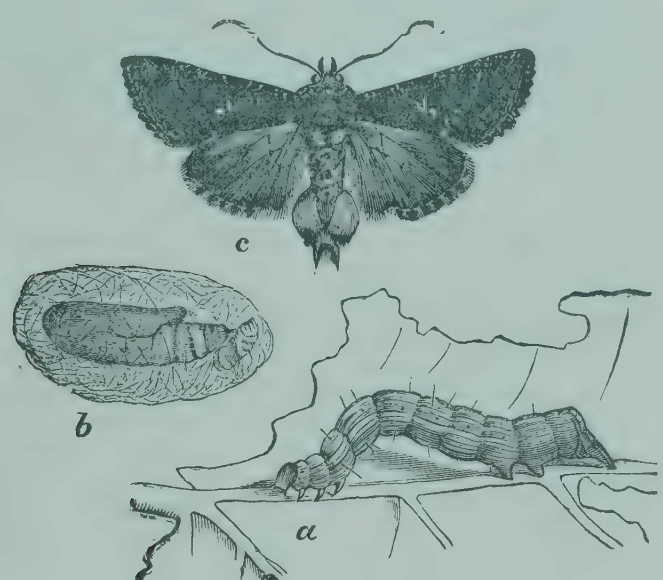


FIG. 2.—THE CABBAGE PLUSIA.
a Larva on leaf; *b* pupa, in cocoon; *c* adult male moth.
(After J. B. Smith.)

injury in Wake, New Hanover, Duplin and Johnston Counties. Most of the damage that is commonly attributed to the White Cabbage Butterfly, is really done by this insect, which is a dark gray moth, that flies at night, and thereby escapes the eye of the farmer. The caterpillar is provided with jaws, and, therefore, eats the tissue, being different in this respect from the Cabbage Bug, which we have just been considering. The insect, in three of its stages, is represented in Fig. 2. The adult insect, with the wings spread, measures about an inch across. There is a silvery-colored spot on each front wing. The figure shows the insect natural size. It will be noticed that the figure shows the caterpillar, *a*, with the back humped up in the middle. By this peculiar habit it may be distinguished from the caterpillar of the White Cabbage Butterfly, which lies flat along the surface of the leaf. The figure also shows the *pupa* at *b*, and this is the stage that follows the caterpillar. In this stage the insect remains motionless, and no food is taken, but the organs of the body are being re-formed so that it shall have the wings, etc., of the adult. The male moth, *c*, has a large brush, or bunch of hairs, on each side of the body near the end. This distinguishes it from the female, which does not have this bunch of hairs.

Remedies.—Various remedies have been suggested for this insect, but the best is to spray the plants with Paris Green in water, at the rate of 1 pound of Green to 150 gallons of water. The idea that this will so poison the plant that it will not be fit for food, is a theory that is not borne out in fact, for if the plants be sprayed simply so as to thoroughly wet the entire surface of the leaves, there will be so little of the poison on each head of cabbage that one would have to eat several dozens of heads at one time in order to get enough of the poison to have any appreciable effect. Furthermore, the leaves to which the poison is thus applied are always taken off before cooking.

Another remedial measure, which we do not know has ever been used in this State, is to mix corn meal or wheat bran with Paris Green, at the rate of 1 pound of the poison to 100 pounds of the bran or meal, and then dust this on the plants. In applying this remedy the poison must be *thoroughly* mixed with the bran, as success will depend on the fact that the poison must be on every leaf of the plants. We believe that in many cases this would be even better than the remedy just discussed. In either case these remedies should be applied as soon as the insects appear, for in the warfare against injurious insects, the rule holds, that "an ounce of prevention is worth a pound of cure."

The WHITE CABBAGE BUTTERFLY (*Pieris rapae*) has been referred to. It has done some damage to cabbage, but not so much as the foregoing. It has been observed doing injury at Raleigh and Wilmington. The damage by this insect is done while it is in the caterpillar state, and the injury is quite similar to that done by the Cabbage Plusia, which has just been considered. With this species, the caterpillar lies flat along the leaf, instead of having the back raised, as is the case with the Plusia caterpillar. We are not able to give a figure of this insect, but most of our farmers are familiar with the white butterflies. The male has one black spot on each front wing, while the female has two, and both sexes have the front wings tipped with black.

Remedies.—The same remedies as described for the foregoing species will apply to this insect.

WHITE GRUBS (*Allorhina* and *Lachosterna sp.*), were reported as doing serious injury in a lettuce bed at Mount Olive, during the winter, and have also been complained of from Wilmington this spring. One of the common species of the grubs is shown in Fig. 3. The adult insect, *3* and *4*, is a brown beetle nearly an inch in length, which is quite common around bright lights in the warm evenings of May and June. They fly about mainly at night. There are many species, and only a specialist can tell them apart. The beetles feed principally on the leaves of trees, and are often found on the peach, plum, and cherry. The grubs, *2*, live under ground, and subsist on the tender roots of plants, mostly of grasses. Often these will be so completely devoured that the turf may be rolled up like a carpet. The figure also shows the insect in its pupa state, *1*, in which no food is taken, as has been explained in the case of the Cabbage Plusia. It takes one or two years for the grubs to obtain full growth and change to adults. These are often very serious pests in strawberry fields, and we suppose that they must do considerable damage to this crop in the trucking section of the State. We would like to hear from some of our truckers on this point.

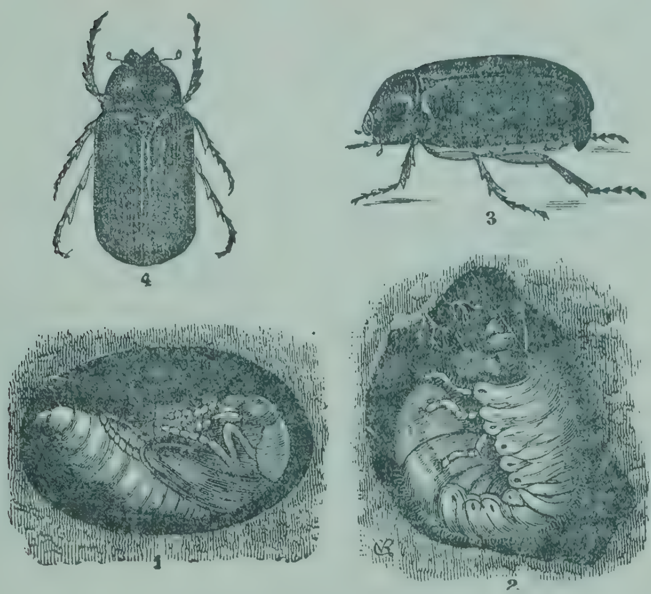


FIG. 3.—WHITE GRUB.
1 Pupa in earthen cell; 2 larva, or white grub; 3, 4 adult beetles seen from side and above. (After J. B. Smith.)

Remedies.—Experiments have been made that show that in sod lands of small area, the grubs may be reduced in number by drenching applications of kerosene emulsion, but this is impracticable on large areas, as in a strawberry field. The best plan is to dodge the insect by not planting strawberries on land just from sod, but cultivate it for one or two years to peas, or some other crop, before setting to strawberries. The grubs do not attack strawberry plants because they like them especially, but because they are in the land when the ground is plowed, and they are compelled to attack the strawberries when their food of tender roots of grass is no longer to be had. By the time that one or two years have elapsed, all the grubs that were in the soil at the time when plowed, will have changed to beetles, and will then have gone elsewhere. The same suggestion will apply equally well in the making of hot-beds. When the grubs once get into a bed, it is not practicable to get rid of them, and for that reason the soil in hot-beds should not be soil just from sod.

FARM INSECTS.

The HESSIAN FLY (*Cecidomyia destructor*) has been reported to us from Guilford County and we have observed it in Alamance. This insect has come to be a miserable pest, and in Ohio, Professor Webster, the able State Entomologist, says that it easily takes the lead in the list of injurious insects of that State, so far as money value of crop destroyed is concerned. The insect in its various stages is fully illustrated in Fig. 4. In the lower right-hand corner, at *i*, we find a small creature somewhat like the parasite of the Cabbage bug. In fact, this is a parasite of the Hessian Fly. Professor Webster reports that this past winter these parasites have been so numerous in Ohio that they have materially aided in keeping the insect in check. Thus we see that nature strives to keep one species of insect from becoming too numerous. In this State its ravages are mostly confined to the western part of the State, if we may judge from the correspondence that we have had with regard to it, and the personal observations that we have made. The adult is a small, smoky-black, two-winged fly, which resembles a small mosquito in its general

FIG. 4.—HESSIAN FLY.

a Egg; *b* larva or maggot; *c* "flax-seed" or pupa-shell; *d* pupa removed from case, all enlarged; *e* fly laying eggs on leaf, natural size; *f* female; *g* male, enlarged; *h* stalk of wheat infested, natural size; *i* parasite, much enlarged.

(After J. B. Smith.)

appearance. With the male, the long feelers (antennae) which project from the head, have prominent tufts of hair on the joints, which feature is not present in the female. The characteristic position of the eggs is shown in the figure at *e*, which shows a female in the operation of laying the eggs. Eggs are laid in the fall, and the maggots that hatch from these live at the base of the leaves, near the ground, and work around the stalk. This so weakens the stalk that when it begins to grow in the spring it breaks over and dies. The larva, or maggot, becomes full grown in the fall and changes to the pupa state, which is often known as the "flax-seed" on account of its size and general appearance. These hatch into the flies in the spring.

Remedies.—Here, again, we must dodge the offender. Fall wheat should be planted as late as practicable, so that the wheat will not be up, till after the fall brood of flies has disappeared. If the flies can be dodged, the crop is safe so far as the Hessian Fly is concerned, for the maggots can not come to your field from the field of your neighbor, as they are without limbs, and can not migrate from one place to another. The stubble should be burned over soon after the wheat is cut, for at harvest time another brood of the insects is in the "flax-seed" stage, and by burning the stubble many of them will be de-destroyed.

The TOBACCO FLEA-BEETLE (*Epetrix parvula*), was reported from Greene County. This insect is illustrated in Fig. 5. The adult insect is very small, being only as long as the little line to the right of the figure of the beetle. It

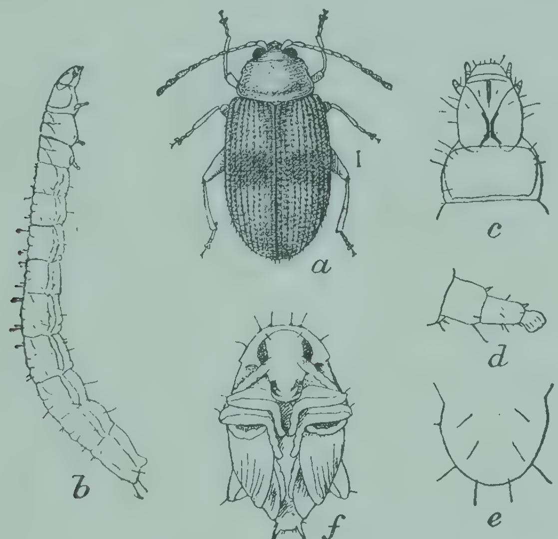


FIG. 5.—TOBACCO FLEE-BEETLE.

a Beetle; *b* larva; *c* head of larva; *d* hind leg of larva; *e* anal segment; *f* pupa, all enlarged.
(After Howard, U. S. Dept. Agr.)

will be noticed that the part of the hind leg near the body is thick and strong, and this gives it great strength, enabling it to leap for considerable distances, which has given rise to the name of "Flea-beetle" for this group of insects. The female deposits her eggs at the roots of a tobacco plant, and the grub feeds on the roots. The pupa state is passed in the ground in a little cell in the same manner as shown for the White Grub, though of course it is much smaller. The damage thus done to the roots is not at all evident,

though it seems that it must sometimes be considerable. It is in the adult state that the insect inflicts the greatest injury. It is provided with jaws, as is the case with all typical beetles, and it therefore lives upon the tissue of the plant, just as the Potato Beetle does. In fact, they belong to the same natural family of insects. The beetles eat small holes into the leaves, attacking usually the lower leaves first, and the upper ones later on. The little holes that they make furnish openings through which fungus disease germs, or *spores*, may find entrance to the plant, so that the damage by the beetles may be supplemented by even greater damage by the diseases.

Remedies.—Practice clean cultivation, and keep the fields free from weeds, especially Jimpson-weeds, Deadly Night-shade, and Horse-nettle, as the insects breed upon these plants. In addition to this, spray with Paris Green at the rate of 1 pound to 125 gallons water. This spraying should be done as soon as the beetle appears, and at that time the lower leaves should receive especial attention in the application of the spray, while the upper leaves may be omitted. Such a spraying will greatly reduce their numbers, but it is well to make an inspection of the fields in the warm days in the fall after the crop is harvested, and see if the beetles are present. At this time they are often present in almost incredible numbers on the leaves that have been left hanging to the stubs. If these leaves in the field be then sprayed with the Paris Green in water, at the rate of 1 pound to 100 gallons of water, it will be a great benefit, as it will greatly reduce the numbers for the next season. This very effectual method of fighting the pest is generally overlooked for the reason that at that time the farmer has the crop gathered, and does not look far enough ahead to see the benefits to be derived from the operation.

The BLACK GRAIN WEEVIL (*Calandra oryzae*), seems to have been very abundant and destructive to grain in barns. It is a common pest in many kinds of stored grain, especially wheat and corn. This insect has been sent to us from Mecklenburg and Guilford Counties, and has been reported to us from Wayne. In the latter county, at least, some of the farmers have been of the opinion that it is the young of the Bill-bug which is so severe on young corn in that region. This idea is entirely erroneous, for, as we have explained in this article, a beetle does all its growing while it is in the larval (grub) state, and a small beetle never grows into a large one. If these pests were the same, the control of the Bill-bug would be simple enough, for the weevil in the barns is easily destroyed, as we shall see. The female insect punctures the kernel of the grain with her strong snout and deposits an egg in the puncture. This hatches into a short, fat, grub, which is without limbs of any description. It is interesting to note in this connection that those grubs that live in situations where they are entirely surrounded by their food do not, as a rule, have limbs. In such a case limbs would be more of a detriment than help. This is an example that illustrates how the food habits, or other habits, for that matter, may, in the course of generations, affect the structure. We regret that we are not able to give figures of this insect.

Remedies.—By storing the grain, if it be corn, in the husk, the damage will be largely averted, but in many cases it is not well to do this, and with other grains this suggestion is with no effect. To treat the grain after it has become infected, it must be placed in a tight bin, and fumigated with Carbon

Bi-sulphide. This is a very foul-smelling liquid, and may be purchased at about 25 cents per pound of druggists. It should be used at the rate of 1½ tablespoonsful to each 100 pounds of grain to be treated. The liquid can be thrown directly on the grain, and the bin must be then covered with a blanket or a heavy oilcloth, to prevent the escape of the fumes of the gas. The whole dose of the Bi-sulphide should not be thrown into the same spot in the bin, but be thrown on in several places, so that the fumes shall go into all parts of the bin. This liquid is something like benzine in its nature and is very inflammable and explosive, and no light or fire can be brought near while the fumigation is going on. This is a remedy that is cheap, effective, and easy to apply, and is the standard remedy for insects that affect the stored grains.

The BILL-BUG (*Sphenophorus sculptilis*) has been reported from Goldsboro. It is a pest to corn in the eastern part of the State. It is especially destructive in low lands, and particularly on land just from rice or rye, and this is because the natural food of the insect is the bulb-rooted grasses. We regret that we are not able to furnish figures of this insect.

Remedies.—Avoid planting after rye, rice, or any of the grass crops, and avoid low lands, as far as possible. Practice clean culture, and allow no more old corn roots, etc., in the fields than can be helped. These suggestions are for the purpose of dodging the insects as much as possible, and they may be supplemented by certain other operations, as to plow land in the fall, so that it shall be subject to the action of frosts in the winter, which will kill many of the hibernating forms. If it is necessary to plant after rice or rye, the stubble of the same should be burned over in the fall, previous to plowing, so as to kill as many as possible in this way. By thus fighting them with both fire and frost, we will reduce their numbers to a considerable degree. If the attacks of the bugs are so severe in a planted field that it becomes necessary to replant, it should be done as late as practicable, so as to have the corn come too late for them. By these practices, we may reduce the loss from the bugs, though we do not claim that the loss will be entirely avoided.

SHADE TREE INSECTS.

The BAG-WORM (*Thyridopteryx empemeraeformis*) is no doubt generally distributed over the State. It has been observed by us at Raleigh, and has been sent to us from Craven and Iredell Counties. It has been observed on various trees in almost every section of the State that we have visited. It is sometimes quite serious in orchards, where its injuries are mostly confined to the apple. In this regard it ranks also as a nursery pest of some importance, and one to be guarded against. The various stages of this insect are represented in Fig. 6. It is while in the larval stage that the insect does the principal damage. The females transform to grub-like creatures, such as is figured at *c* in the illustration, while the males change to pupæ, such as shown at *b*, and from these moths are then hatched, such as is shown at *d*. The grub-like female never leaves the bag, but after mating, the eggs develop in her body and she dies. The case of a female, cut open lengthwise, is shown at *e*, and it will be noticed that the shell of the body of the insect contains many eggs. We will see by a close study of the figure that the life-history of this species is quite complicated. The spread of the species in orchards or

nurseries, is quite slow, owing to the fact that the females are wingless, for the males take no part in the spread of the species, but only in the reproduction. The insect is most commonly found on cedar, juniper, and arbor-vitae

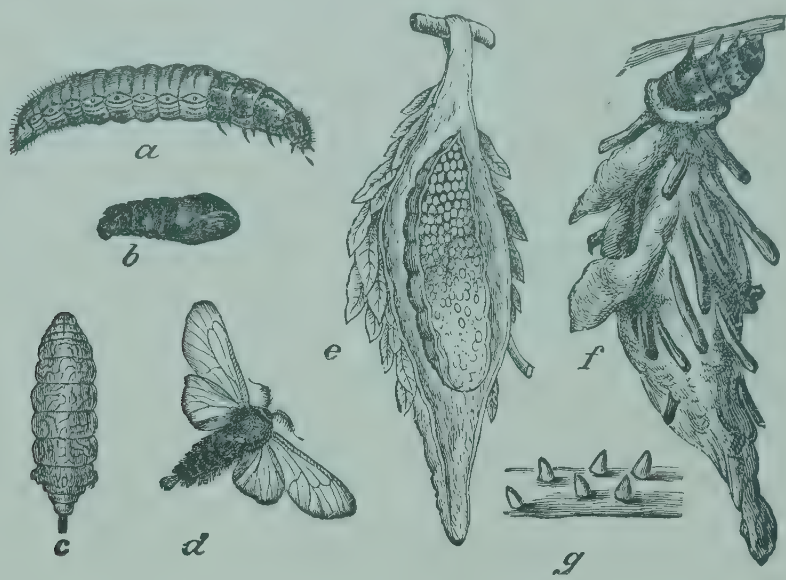


FIG. 6.—THE BAG-WORM.

a Larva; *b* pupa of male; *c* adult female; *d* adult male; *e* case of female opened to show eggs; *f* larva with case; *g* young larvae with bags, on twig. All natural size.
(After J. B. Smith.)

Remedies.—In many instances the easiest method to subdue the insect is to pick the cases from the trees and burn them. If they are simply picked and dropped on the ground, the insects can crawl back to the tree again. The best time to do this work is in the winter, as the trees are then bare, and the cases can be more easily seen, and also, each female that is then destroyed is equivalent to many worms in the summer, as we have explained in considering the egg state of the insect. When apple trees are infected, a spray of Paris Green in water at the rate of 1 pound of Green to 150 gallons of water will be sufficient. In apple orchards, the trees should be regularly sprayed every year for the Codling Moth (described later), and if this is done properly, the Bag-worms will also be destroyed by the treatment. and will not become troublesome.

The ELM LEAF BEETLE (*Galleruca xanthomelaena*) was sent to us from Forsyth, and also from Stokes Counties. It seems to be generally on elms all through the Piedmont section, and did considerable damage last summer. To what extent injuries have been inflicted in other towns by this insect we do not know, as we have not yet been able to make the investigations necessary to decide this important point. In more northern towns it has been found eminently worth while for city governments to take up the work of fighting this pest, and we think that if it is as much of a nuisance in the Piedmont region as it has been reported to us, it would be wise for some of our towns to take the matter up in the same way. Three reports of this insect have come to us from the town of Winston. In Maryland, the writer has climbed to the tops of elm trees fully fifty feet in height, taking with him the pump and other appliances necessary to do the spraying for this insect,

which threatened to destroy the foliage of several fine elms in the grounds of one of the public buildings. This insect, with specimen of its injury, is illus-

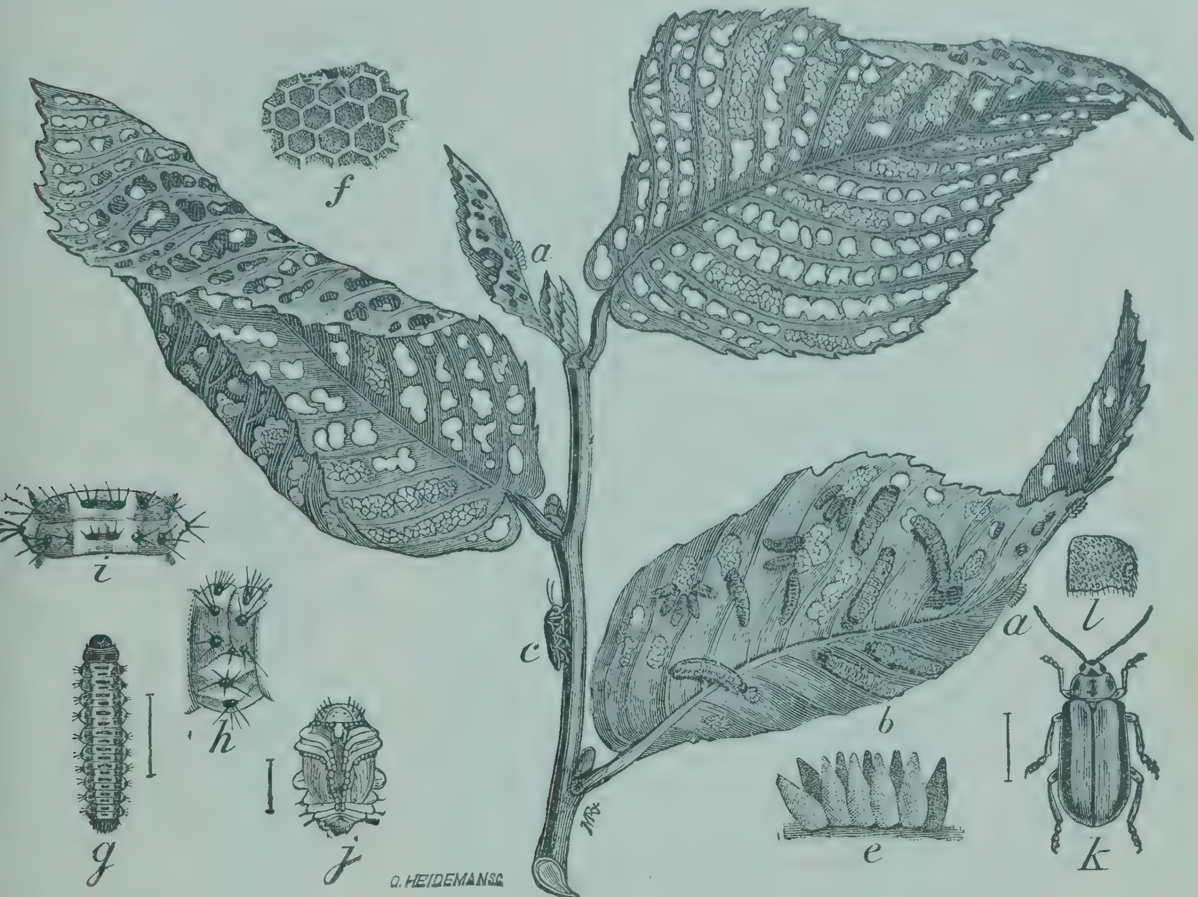


FIG. 7.—ELM LEAF BEETLE.

a, a Eggs on leaves; *b* larvae feeding; *c* adult, natural size; *e* egg mass; *f* surface of egg; *g* larva; *h i* details of same; *j* pupa; *k* beetle; *l* surface of elytra. All enlarged.
(After J. B. Smith.)

trated in Fig. 7. A cluster of eggs is shown enlarged at *e*, and the larva, pupa and adult are shown at *g*, *j* and *k*, respectively, all of which are enlarged. The figure also shows specimen twig, showing eggs, larvæ and beetles natural size. There are two broods each year in North Carolina. When full grown the larvæ descends from the tree and pupate under rubbish, or among grass stems, etc., on the ground. A few select some crevice in the bark in which to undergo their transformations.

Remedies.—The trees should be sprayed with Paris Green and water as soon as the leaves appear, at the rate of 1 pound to 125 gallons, with as much slaked lime added as is used of the Green. Another spraying should be given as soon as the insects appear. Chaff should be placed at the base of the trees so that the larvæ will take refuge in it when they come down the trees to pupate. While they are undergoing their transformations in the chaff, they are easily killed by the application of hot water, with which the chaff should be soaked every week. If they appear in injurious numbers in the second brood, another spraying should be given.

FRUIT INSECTS.

We now come to consider those insects that attack our fruit producing plants. On account of the large number of pests that come under this head, the work in connection with the study of these insects comprises a large portion of the duties of the Entomologist. Among the pests of fruit trees, we find those which have made our orchard and nursery inspections a necessity, and which have given rise to much legislation, most of which has been very useful, though the lack of harmony among the laws of the different States sometimes works a temporary hardship to dealers in fruit trees. These and other pests have also given rise to the nursery fumigation regulations, with which the Commission Controlling Crop Pests is charged. Though our State nurseries are not yet all practicing the fumigation, we expect that they will all fall in line with the movement within a short time, when they can be brought to see that it is not so expensive an operation as they think. Some of our more progressive nurserymen are already practicing it. We believe that our State nurserymen, as a rule, are willing to do what they think is right to prevent the spread of these destructive insects, and we commend them to the patronage of those farmers of the State who are planting orchards. With our present laws conscientiously enforced, and with our growers fully awakened to the necessity of treating trees that are affected with insects or diseases, we can not but believe that the annual loss to the farmers of the State from these destructive agencies will be much reduced. We are of the opinion that the decline of apple growing in the eastern part of this State has been largely due to the ravages of insects and diseases, many of which can be kept in check to a large degree by the application of spraying mixtures.

We recommend our growers to adopt newer methods—cultivate, fertilize, prune, and spray the orchard, and if it does not produce sufficient fruit for your needs, we shall be surprised. We recommend you to deal with the state nurserymen, of which there are over forty.

The SAN JOSE SCALE (*aspidiotus perniciosus*) is probably the most famous of all the fruit pests, and owing to the fact that its spread is largely dependent on the transportation of infested plants from place to place, many States have enacted laws compelling examination of nursery stock by competent men. We believe this to be wise, and to our personal knowledge we know that it has resulted in great good to the fruit growers. The appearance of a twig that is infested with this minute insect is shown in Fig. 8. At *a* this is shown natural size, while at *b* it is represented very much enlarged. In the enlarged picture, we see that the appearance is as if the bark of the twig were covered with little scale-like objects. Each of these covers the body of a minute insect. These have their little beaks inserted into the tissue of the bark and suck the sap. In the enlarged figure some newly-hatched young will be noticed, which have legs. They only retain these for a short time, and when they settle down to feed, and shed the skin, the legs disappear. After once settling down to feed, the female insects remain attached to the spot. The males, however, when grown, acquire wings with which they can fly for short distances. The insects increase with such marvelous rapidity

that figures convey no idea to the mind. Thus, it has been estimated by so competent an authority as Dr. L. O. Howard, the Government Entomologist at Washington, that in a single year, if no fatalities occur, the progeny of a single fertile female might reach 3,000,000,000 individuals. It is small wonder, then, that a tree will soon succumb to the attacks of such a host. A

a b

FIG. 8.—SAN JOSE SCALE.

a Appearance on bark, natural size.
b As it appears under a lens.
(After Howard & Marlatt, in Bul. 3, U. S. Div. Ent. Dept. Agr.)

peculiar feature regarding this species is that the young are born alive, there thus being no egg stage. An infested branch soon becomes so thickly covered that the scales overlap one another and form a continuous crust, which may be removed by scraping. This pest has now been located in orchards at the following points in this State: Wilmington, Southern Pines, Aberdeen, Gastonia, Durham, Waynesville, Mount Holly, Stateroad (Surry County), Raleigh, Burlington, and Oak Ridge. The pest affects apple, plum, pear (except Keiffer), cherry, peach, and various other trees.

Remedies.—In considering remedies for this insect, we must bear in mind that peach and plum can not stand as strong applications of insecticides as the other fruit trees. The strength of emulsion that is best to fight the in-

sect on apple is too strong to be used with safety on peach and plum. On peach and plum, we recommend kerosene emulsion at the strength of 20 per cent kerosene for a winter spray. Care must be taken not to allow the emulsion to run down the trunk of the tree to the roots, as that may be fatal to the tree. We believe that in the winter 25 per cent may be used if sufficient care be taken, but we would not advise stronger than that under any consideration, with our present knowledge and experience. Very badly infested trees will be so weakened that they had best be removed and burned on the spot, and not even dragged out of the orchard if it can be avoided. This last suggestion it is especially important to observe in the summer, as the dragging out of trees at that season is likely to result in the insect gaining footholds in new trees, as a result of contact with them. For a summer treatment, a 10 per cent emulsion can be applied after the fruit is removed, and spraying at this time is very useful, as the insects are then breeding most rapidly and are most subject to remedial treatment.

For apple and pear, we would make the same suggestions for the destruction of very badly-infested trees, and for work during the summer, but for a winter treatment we may use a stronger emulsion, 30 or even 50 per cent (in the higher altitudes, as in the western part of the State), will not be injurious if not allowed to run down the trunk and soak in at the roots. If possible, the sprayings with the emulsion should be applied on a bright, sunshiny day, and if a very light breeze is blowing, so much the better. Before applying the winter spray, the trees should be severely pruned, so that there will be no more of the material used than necessary, and also so that all parts of the tree may be more easily reached. In any case, we strongly advise farmers to consult with this office if they have reason to believe that their trees are affected, so that we may give advice, which we are always glad to do. Some farmers think that their trees are affected with Scale, when in realtiy, it may be Fire Blight, in which case, spraying is of no avail. In case of any enemy affecting the trees, send us specimens, and when we have ascertained the difficulty, we will be able to advise you so that you may proceed intelligently.

The SCURFY SCALE (*Chionaspis furfurus*) has been twice sent to us from

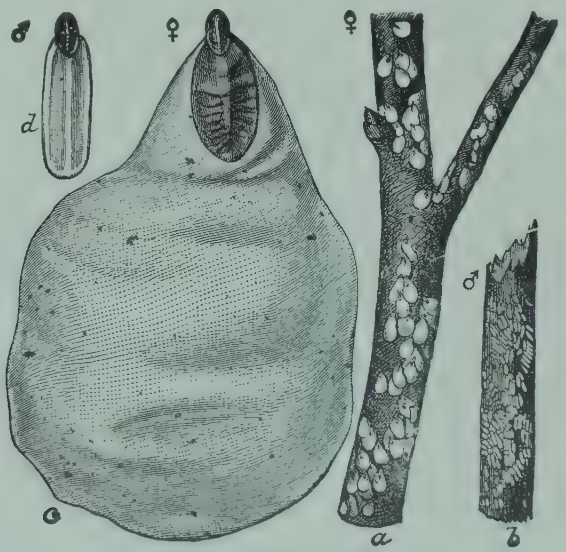


FIG. 9.—SCURFY SCALE.

a Twig with female scales; *b* twig with male scales, natural size; *c* female scale; *d* male scale, enlarged.

(From U. S. Dept. of Agriculture.)

Haywood County, on apple, and has been observed by the writer doing considerable injury at Waynesville in another orchard. It attacks principally apple and pear, and is no doubt generally distributed over the western part of the State, where apples are largely grown. The appearance of the insect is shown in Fig. 9. The insect passes the winter in the egg state, which is protected by the scale of the female. These eggs are purplish in color, and hatch to young lice in the spring, which soon attach themselves to the twigs as described for the San Jose Scale. This insect is not regarded as very serious further north, but a competent grower at Waynesville has assured me that it has killed trees in his orchards.

Remedies.—For summer treatment spray with 10 per cent kerosene emulsion, and for winter treatment spray with 30 per cent.

The OYSTER SHELL BARK LOUSE (*Mytilaspis pomorum*), has been sent to us on apple from Cherokee, Haywood, Buncombe, McDowell, Alleghany and Ashe Counties. It affects apple, and to a lesser extent, the other fruit trees, and is also frequently found on maple, and mock orange. It is no doubt generally distributed through the western part of the State. Samples of the fruit from Yancey County have been found to be infested with the scales of

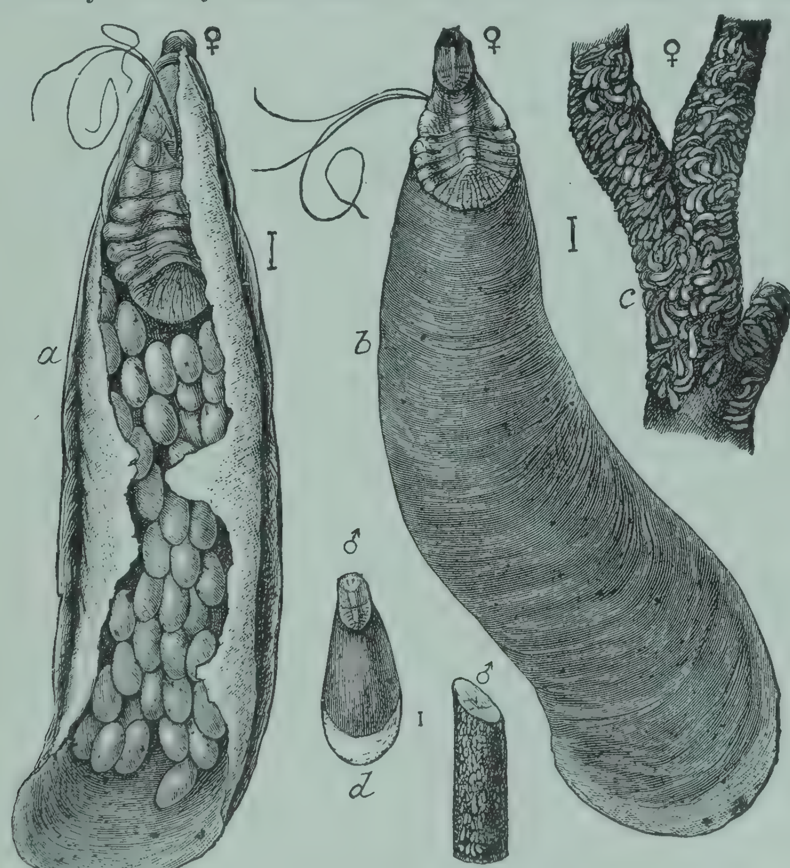


FIG. 10.—OYSTER SHELL BARK LOUSE.

a Female from beneath, showing eggs; *b* same from above enlarged; *c* twig infested with female scales; *d* male scale and twig infested with same.

(From U. S. Department of Agriculture.)

this species. The insect is shown in Fig. 10. From the letters that we have received, we are forced to the same conclusion as that reached with regard to the Scurfy Scale, for while it is not serious in the more northern States, it

seems to do considerable damage in North Carolina. The life history and habits are quite similar to those of the Scurfy Scale, just described.

Remedies.—Same as for Scurfy Scale.

The WOOLLY APHIS (*Schizaneura lanigera*) has been sent to us from Wayne County, and brought to us in Raleigh, and has been observed by us in an orchard in Haywood County. It is represented in Fig. 11. In the figure the

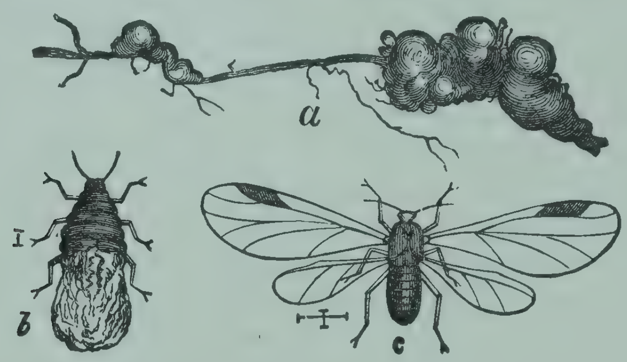


FIG. 11.—WOOLLY APHIS.
a Galls on apple root; *b* wingless form, with wax on body; *c* winged form without wax. (From Lippincott Co.)

insects are represented very much enlarged, while the gall on the root is shown natural size. The insect is of a dull red or bluish purple color, and may be found either on the branches or roots of the apple. Its injuries are quite severe, and not infrequently result in the death of the trees. It is one of the pests that we must watch in the nursery, as well as in the orchard. The life-history of the insect, as of all the plant lice, is very complicated and interesting, but we have not the space to discuss it here.

Remedies.—The form that attacks the trunk and branches of the tree may be controlled by applications of kerosene emulsion. This should be at about 30 per cent if the trees are to be treated in the winter, or 15 or 20 per cent if in the spring or summer, when the foliage is on the trees. As the insects live in colonies, it is often easy to apply the emulsion by hand, with a brush, but where the tree is thickly infested in the upper as well as the lower branches, spraying is the best method of reaching them. The underground form is very hard to combat. In the nursery, trees that are badly affected in the root by this insect had best be discarded, and those that are only moderately infested should be fumigated, as in accord with the fumigation regulation that we are now introducing into our nurseries. In the orchard such infested trees may be treated by removing the earth from the base of the trees, till the roots are more or less exposed, and applying tobacco dust in liberal quantities.

The CODLING MOTH (*Carpocapsa pomonella*) probably inflicts more loss on apple growers than any other one insect. We have reports of its ravages from two points in Haywood County, also from Watauga. It is generally distributed throughout the whole United States. The insect in its principal stages, and a sample of its work, is shown in Fig. 12, all of which are natural size except *h*, which gives an enlarged view of the head of the larvæ. The caterpillar of this moth is the common "worm" in apples, which we all know only too well. The egg is laid on the young leaves or on the newly-set fruit soon after the blossoms fall, and the larvæ of the first brood enter the fruit,

nearly always at the blossom end. The larvæ of the second brood seem to enter the fruit nearly as often on the side as at the bloom end. It feeds in-

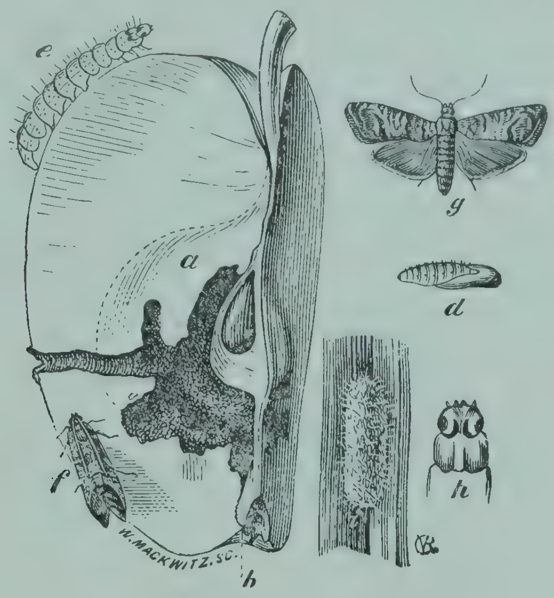


FIG 12.—CODLING MOTH.

a Apple cut to show borings of larva; *b* place where egg was laid and larva started; *d* pupa; *e* larva; *f g* moths at rest and with wings spread; *h* head of larva; *i* cocoon.
(From Lippincott Co.)

side of the fruit till grown, when it drops or crawls to the ground, or into some secure crevice along the trunk or larger branches, to pass through the pupa stage to the adult moth. There are probably two broods each year in this State.

Remedies.—To combat this insect to the best advantage, three sprayings and some other supplementary work are necessary. But at the same time that we apply the remedy for this pest we apply one for numerous other pests, so we shall here give considerable space to the discussion of the manner of spraying for this insect. The three sprayings should be given about as follows:

1. Just before buds burst in spring.
2. Just after the blooms fall.
3. About 15 days after the second spraying.

The material to be applied in these sprayings is Bordeaux Mixture with Paris Green. The Bordeaux is not of any use as against the worm, but is for the fungous enemies of the apple, as the scab, blights, rusts, and rots that inflict so much loss every year. We will give full directions for making up this material, for we believe that three thorough sprayings with this at the times indicated will, in large measure, solve the difficulties now surrounding apple growing in this State as well as other States.

FORMULA.

Copper sulphate (blue-stone)	6 lbs.
Lime (slaked)	4 lbs.
Water	45 gals.
Paris Green	6 oz.

Directions.—Dissolve the copper sulphate in 20 gallons of water. To do this to the best advantage, have some water hot and after dissolving the sulphate, add more water to make 20 gallons. Slake the lime, and add water to make 25 gallons of the lime milk. Now pour the lime water and the water with the copper sulphate together into a *clean* barrel and stir them together vigorously. If properly made this will give a very pretty blue mixture. This is the Standard Bordeaux Mixture, to which we must now add the Paris Green. We now take the 6 ounces of Paris Green and mix with a little water in a bowl or china cup, so as to form a thin paste, and pour this into the Bordeaux Mixture, and stir vigorously, so that it shall be thoroughly distributed through it. This gives 45 gallons properly poisoned. We have explained this in detail, for every owner of an orchard should know how to make and apply the Bordeaux Mixture and Paris Green. The material should now be tested to be sure that there is enough lime so that the copper sulphate will not hurt the foliage. This test is made with *Dissolved Ferro-cyanide of Potasium.* Any druggist can supply this material, and a gill is enough to make all necessary tests for several years. Add a few drops of this to the Mixture, letting it drop directly into the Mixture without stirring, and if it gives a purple color, more lime must be added. In adding this lime, it should be added in a thick milk, so as to add as little water as possible. Add lime till the Ferro-cyanide gives no purple color to the Mixture, and then you may know that it is ready to apply.

While the description of this process may seem long it is really very little trouble to make up the Mixture, and the writer has made it time and time again. In the spraying, we can not lay too much stress on the fact that the success of the operation will depend absolutely on the thoroughness with which it is done. In order that the operation shall be successful against the Codling Moth, for which this spraying is mostly to be applied, some of the poison must be lodged in the blossom end of the fruit soon after the bloom has fallen. Any fruit that has not this poison in the blossom end, may, therefore, be infested with a worm, hence, the fruit grower can see that absolute thoroughness is the only rule that he can afford to follow in spraying. Spray pumps are so made that they throw a very fine mist, which can be easily thrown into all parts of the tree, and it does not take long to go over a tree thoroughly. Every leaf should be thoroughly wet. For trees as much as six or seven years old, it need not take more than five or six minutes to a tree, if it is done with a knap-sack pump, or a little longer with some of the others that are set down, and are moved around the tree as the spraying proceeds. A tree should be sprayed from at least two sides, and if from three different directions, it will be much better.

About the middle of June a burlap of old fertilizer sack should be placed about the trunk of the tree, about midway between the ground and the first limb. Beneath this many of the larvæ will take refuge to pupate, and by examining these burlaps each week, and destroying the larvæ and pupæ that are found beneath them, their numbers will be very greatly reduced. This banding of the trees is important, for we have stated that the worms of the second brood enter the fruit on the side as well as through the bloom end, and spraying is very little use against the second brood, hence the importance of destroying all the moths that we can.

We are indulging in no theories on the point of spraying, etc., for this and other pests, but simply stating facts that have been proven over and over again. Spraying is not a new thing, nor an experiment, but an operation the value of which has been demonstrated beyond a doubt, and the grower is behind the times who does not acquaint himself with the best methods of spraying for the pests that trouble his fruits and other crops.

The PEACH TREE BORER (*Sannina exitiosa*), is well known to all peach growers. It is a veritable nuisance at Southern Pines, and has been inquired about from Cleveland County. This insect is shown natural size in Fig. 13. The peach grower should become familiar with the adult insects and learn to distinguish the male from the female. The male is smaller and is grayish in color, while the female is steel-blue, with a yellow band about the middle of

FIG. 13.—PEACH TREE BORER.
Male moth to the left, female to the right. Natural size.
(After Lintner.)

the body. In both sexes the hind wings are transparent. The larvæ live around the roots of the peach trees, between the bark and the wood. They cause large quantities of gum to exude from the tree at the surface of the ground, thus betraying their presence. We have known as many as thirteen of these worms to be taken from a single tree in a neglected orchard. The pupa stage is passed in a rude cocoon which is composed of silk, bits of wood and gum from the tree. From these cocoons, the moths emerge.

Remedies.—Digging out the larvæ by hand is the remedy most commonly practiced, and at least, it is a very thorough method, though very troublesome. Experiments made in New York State have shown that smearing the trunks of the trees with tar is a good method of preventing the moths from laying their eggs on the trees. This should be smeared on the trunk from the surface of the ground to a height of 15 inches. The earth should be removed from the base of the tree, so that the tar may be placed on the trunk a little below the surface. If this be used in conjunction with the digging-out process the worms will be greatly reduced in number. The worming is done at any time in the winter, but best in the very early spring, before the first of April. If, after removing the worms from a tree, a handful of lime be sprinkled at the base of the tree, the insects will not be likely to trouble it again so readily as they otherwise would. By these methods, we are able to secure the best protection from the Borer of which we know.

The BLACKBERRY CANE BORER (*Agrilus ruficollis*) was sent to us from Moore County. The beetle and its larvæ are represented enlarged in Fig. 14, and the work is illustrated in Fig. 15. The gall which it causes is sometimes called the Gouty Gall. The adult insects do no particular damage. In North Carolina the adults appear in the middle of May, according to breeding experiments that we have made in this office. Eggs are deposited soon thereafter,

and when the larvæ hatch they bore into the young canes of the young blackberry, as the eggs are laid on them. The winding burrow that they make in

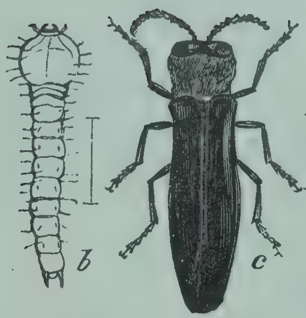


FIG. 14.—BLACKBERRY CANE BORER.

b Larva; *c* adult enlarged. (After J. B. Smith.)

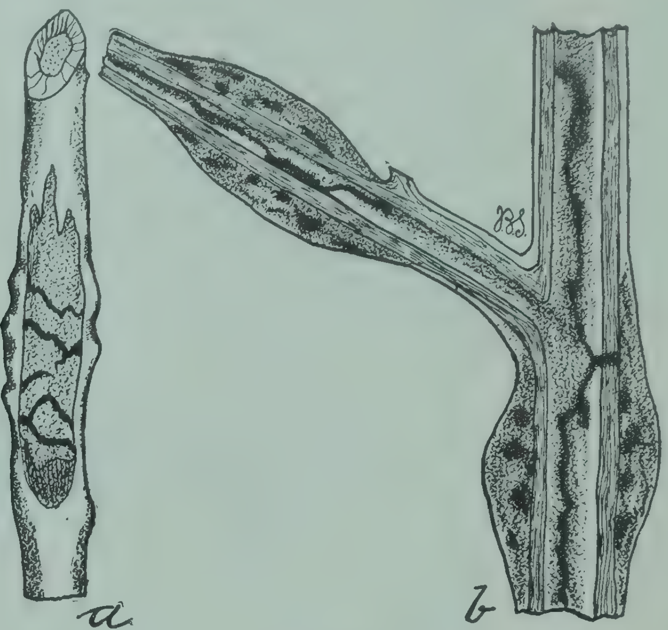


FIG. 15.—BLACKBERRY CANE BORER.

a Gall made by borer, just beginning to grow; *b* section through an old gall. (After J. B. Smith.)

the cane interferes with its normal growth, with the resulting gall, as shown in the figure.

Remedies.—The most satisfactory remedy is to cut out the old galled canes in the spring, some time before the first of May, and burn them. At this time the developing insects are in the canes, but a little later they emerge, as we have shown. As a supplementary measure, newly sprouted canes may be cut off at the surface of the ground about the middle or last of June, so that the young grubs that are in them at that time will be starved, for they are without limbs, and are thus unable to migrate to new canes. A new crop of canes will come up later on, so that there will be plenty for the grower's purposes. A combination of the two methods here mentioned will be most effective.

The PLUM CURCULIO (*Conotrechellus nenuphar*) occurs in great numbers at Southern Pines, where it is a regular pest in both peach and plum orchards. The insect in its stages, and a beetle on a small plum is shown in Fig. 16. The female punctures the fruit of the plum or peach with her snout, and deposits an egg in the puncture. The larva bores directly into the flesh of the fruit and feeds until grown, when the spoiled fruit falls to the ground, and the grub goes an inch or two below the surface to pupate, and finally emerges as a beetle. After depositing the egg, the female cuts a crescent around it, on the fruit. The object of this is yet a mystery.

Remedies.—Jarring the beetles from the trees into sheets, is the best method yet discovered for the control of these beetles. After being thus collected, the beetles may be crushed with the fingers, or killed by fire, or by being poured into a pan of kerosene or similar material. At Southern Pines

a method of jarring is practiced, in which two men are engaged in the operation. Each is provided with a frame, upon which is stretched a sheet, which forms a half circle. The two men approach the tree from opposite sides, and place the frames close to the trunk, so that the circle thus formed is about as large as the spread of the tree. One of the men then gives the tree two or three smart taps with a heavy stick which is wrapped with an old sack, so that the tree will not be bruised. The beetles have a habit of dropping to the

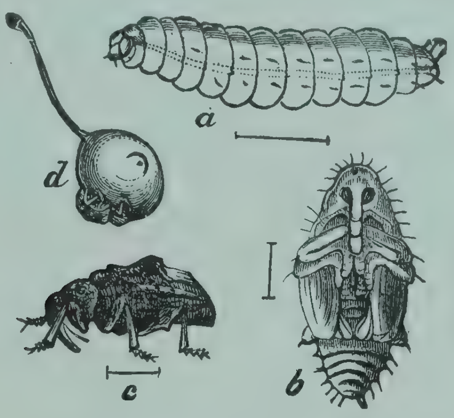


FIG. 16.—PLUM CURCULIO.

a Larva; *b* pupa; *c* adult; *d* beetle at work on young plum, showing cresent mark.

ground when there is any danger, and in this case they fall into the sheets spread for them. The men then move on to the next tree. The beetles are rather sluggish, and do not fly readily, and instead of taking flight to another tree, they will crawl around on the sheet, for a long time. After thus jarring several trees, the men stop and examine the sheets, and crush all the curculios they can find. If they come to a tree from which they jar a considerable number of beetles, it is well to destroy them at once, before they have a chance to escape. In this way they will proceed as fast through an orchard as a slow walk. In some of the large New York orchards a wheelbarrow is used upon which is a frame, that forms a complete circle, save for a narrow strip to the center, and this is run up to the tree, the trunk being received into the slit in the frame, and the tree is then jarred in the same manner as here described. In this only one man is employed. The writer has never seen the wheelbarrow method in operation, but he believes that with the method used by our Southern Pines growers, the operation is so much faster that it more than compensates for the two men employed. The work of jarring should be done in the morning, as the beetles become more active later in the day, and are more likely to escape. Observations made by Mr. R. W. Caviness, at Southern Pines (to whom I am indebted for many practical observations on various fruit insects), indicate that the adult beetles hibernate in the woods, as the trees that first showed signs of curculio this spring were those that were along the woodside.

From the facts that have been here presented, it will be seen that with most insect pests the best remedy is to apply a spray of some kind. For the convenience of the farmers, we give herewith a list of dealers in spraying

appraratus. These will all be glad to send their catalogues to any who apply for them,—such request should be made stating that their prices are wished on spray pumps, for their regular catalogues in many cases are not about spray pumps. If the farmer is not sure what kind of a pump he needs, we will be glad to help all we can. If a farmer wishes our advice in the matter, he should give us a full statement of the use to which he wishes to put his pump. Thus the farmer may wish a pump to spray only one or two trees, in which case a bucket pump will be all that is necessary, but at the same time he should remember that at any time he may have need to spray his garden plants, so that he must keep all these things in mind in getting a pump. If we know how much land a farmer has in garden truck, and how many trees he has, etc., we can tell pretty well what kind of a pump will be best for his use, but otherwise we can not. It is necessary, therefore, to give full description of the need, in case you wish us to recommend a pump for you.

Mr. C. C. Lindley, of Old Fort, N. C., is agent for the Deming Co., and for the Gould's Manufacturing Co.

DEALERS IN SPRAYING APPARATUS.

Gould's Mfg. Co.	Seneca Falls, N. Y.
Deming Co.	Salem, Ohio.
Field Force Pump Co.	Lockport, N. Y.
P. C. Lewis & Co.	Catskill, N. Y.
Wm. Stahl	Quincey, Ill.
Morrell & Morley	Benton Harbor, Mich.
H. B. Rusler	Johnstown, Ohio.

Aside from the insects thus described, the following have also come under our observation, either by correspondence or otherwise: *Black Peach Aphis*, *Oak Scale*, *Beech Blight*, *Flat-headed Apple Borer*, *Thirteen Spotted Lady-beetle*, *Peach Twig Girdler*, *Fruit Bark Beetle*, *Oak Gall*, *Peach Twig Borer*, *Striped Cucumber Beetle*, *Cotton Louse*, *Potato Beetle*, and others upon which we have notes recorded.

If this article will serve to arouse a keener interest among farmers in the work of this office, and will induce them to patronize the office by sending us specimens and inquiries, the writer will feel well paid. The office is here for the benefit of the farmer, and we are striving to make its work practical, as well as to aid the farmer to take more of a scientific view. In making the work of value to the farmers, we ask the aid of all concerned.

REPORT ON TEST FARMS.*

BY B. W. KILGORE.

Experiments with cotton, corn, Irish and sweet potatoes, are being repeated this year on the same plans and on the same tenth and twentieth-acre plats used for each particular experiment last year. Some forty-eight different tests are being made with each cotton and corn. Twenty-two (22) of these are devoted to different combinations and amounts of acid phosphate, cotton-seed meal, and kainit, with a view to determining the best balanced fertilizer and the best paying amount for these crops on these particular lands. Three plats are given to testing the effect of dividing the fertilizer, and applying in one case half of all constituents at planting and half later, and in two cases to applying all the acid phosphate and kainit and one-half the meal before planting, putting on the other half of the nitrogen later, as nitrate of soda on one plat and as cotton-seed meal on the other. (These two plats gave us our best results last year.) Two plats are devoted to different methods of cultivation. three to rotations to see if vetch and peas—winter and summer growing nitrogen-gatherers—will not collect from the air all the nitrogen that is needed by these crops; two plats to testing the effect of lime, three to compare cotton-seed meal, cotton seed, and stable manure as sources of nitrogen, two to test acid phosphate and finely ground phosphate rock as sources of phosphoric acid, two to different depths of applying the fertilizer, four to show the effect of velvet beans, soja beans, cow peas, and peanuts grown last year on this year's crop, giving them only acid phosphate and kainit both years as fertilizer, and eight to testing varieties of cotton and corn, together with different distances of plants in the rows and different distances of rows.

The experiments with Irish and sweet potatoes are not so extensive as those with cotton and corn, being aimed mainly to determine the best balanced fertilizer and paying amounts for these crops, together with a few variety tests, and in the case of Irish potatoes to making comparison of the different forms of potash, kainit, muriate, high and low-grade sulphate on the quality of the tuber and tests for the same purpose of nitrate of soda, cotton-seed meal and fish scrap as suppliers of nitrogen and of tobacco stems to supply the nitrogen and part of the potash, and to see if they will not, at the same time, prevent the growth of the scab-producing fungus.

We have at Tarboro tests of thirteen (13) kinds of wheat, three of rye, one of barley, and six of oats, all having been sown last fall. Further tests are being made with two of the varieties of oats—the red rust proof and turf—to compare the effect of fall and spring sowing and of planting broadcast, and in 9-inch and 18-inch drills.

One-twentieth-acre plats of between thirty and forty different kinds of grasses, clover, and other legumes and combinations of grasses and legumes are being tested at both Tarboro and Red Springs. Up to this time quite a number of these have done well, but it is not safe to draw conclusions too

* Extract from report of the State Chemist to the Board of Agriculture at its June meeting.

WHEAT FIELD ON FARM OF E. L. DAUGHTRIDGE, EDGECOMBE COUNTY, N. C. YIELD, 30 BUSHELS TO THE ACRE.

early regarding any of them, and certainly not till they have been subjected to the test of the hot, dry summer and fall months. Of the grasses, tall oats, Italian rye, and English rye, early grazing and hay grasses, have succeeded specially well and are now ready to cut for hay. Sheep, red, and meadow fescues, and seaside, Canada, Texas and Virginia blue grasses—all grazing grasses—indicate well. Of the clovers, burr, sweet, alsike and crimson, as well as alfalfa, have come up fairly well and the burr and alsike clovers and the alfalfa are growing well. None of the land used, however, has been in clover before and it will be necessary to either inoculate the soil or else wait for nature, in a slower way, to do so before it can be said with any certainty that these legumes are successes or failures. An effort was made to inoculate the different kinds of vetch seed for sowing on the plats, as well as the hairy vetch for the ten-acre field of oats and vetch, by the use of an extract of soil on which vetch had made a splendid growth for a number of years. In this we were only partially successful. On a considerable unmber of the plants the vetch bacteria took hold and these plants have made a splendid growth, but the greater portion of them did not become inoculated and are practically complete failures. Experience, however, with this plant elsewhere, the good growth of the inoculated plants in our present test, and the excellent growth of spring vetch in fields and along the roadsides in various parts of the East, make us believe that the success of this plant in the East is assured, and it certainly means a great deal to that section when properly understood. Vetch and Bermuda will furnish pasturage for stock nine to ten months in the year and the vetch will give a large amount of most excellent hay.

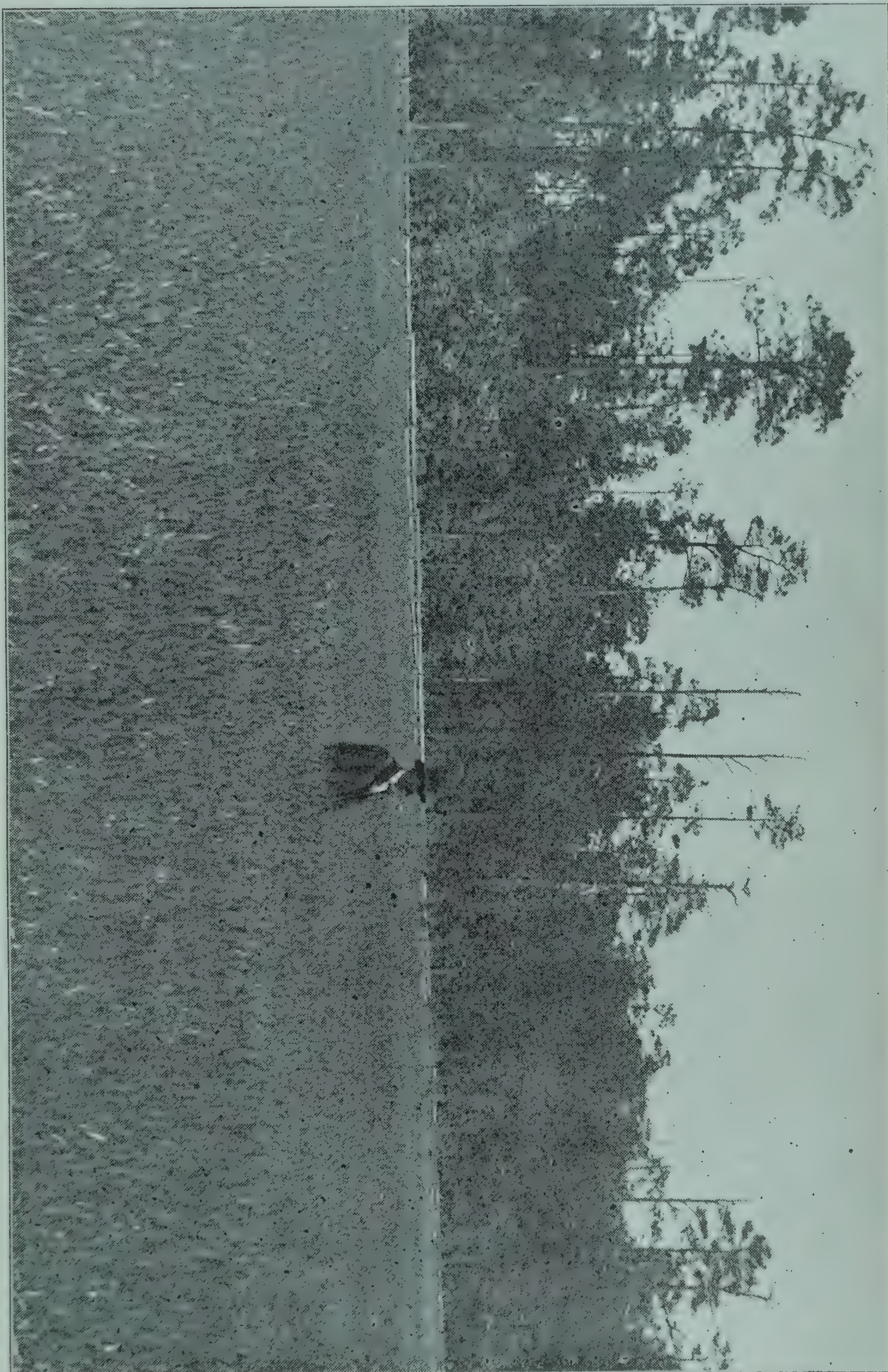
The rotation experiments at both farms on 30 acres—divided into three ten-acre plats, one being oats and vetch and the other two in cotton and corn, to follow each other every three years—is well under way. In fact, I consider that the Department's experimental work is assuming most satisfactory shape, and with the soil survey make as useful and important a line of investigation as can be undertaken for the agriculture of any State. They —the soil survey and the test farms—are bringing the Department in close touch with the farmers of the State, and I know from first-hand knowledge that the farmers are interested in them and are looking and hoping for their extension. There is an abundance of work that needs to be done in the line of experimental agriculture. This State was the second in the Union to establish an Experiment Station, being conducted during the first eleven years of its existence in connection with and by the support of the Department of Agriculture. Since 1887 it has been financed by the Hatch appropriation of the National Government. Every State and Territory in the Union now has at least one Experiment Station, and they have become permanent institutions of great power for the advancement of the agriculture of the several States. So much so is this, that the National Government gives annually nearly three-quarters of a million dollars for their support, and the States, in one way or another, $350,000, either to supplement the Station fund proper or to conduct independent experiments by other institutions. Connecticut has two Experiment Stations, the State giving over $14,000 to their support; New York two, with State aid of $87,000; New Jersey two, with $17,000 from the State; Louisiana three, with $40,000 additional help,

largely the work of the Department of Agriculture; California one main station, four culture and two forestry stations, in different sections of the State, receiving $11,500 from the State; Alabama one regular station and two sub-stations, receiving $4,500 from the State; Colorado two sub-stations in sections away from the main station; Michigan two in other sections, with State aid of $2,500; Minnesota three in separate sections, with $32,000 additional appropriation; Mississippi one additional sub-station; Missouri one horticultural station apart from the main station, receiving $7,500 from the State; New Mexico three sub-stations; Ohio two sub-stations away from the main one, all receiving $25,000 additional help; Texas one sub-station, getting $2,500 additional funds; Washington two sub-stations away from the main one, with $4,000 State help; Wisconsin gives $14,000, and Massachusetts $11,000 to the main stations. Canada has six experimental farms in different parts of the Dominion, all supported by Federal appropriations, and the Virginia Department of Agriculture is following the plan of this Department and is establishing test farms on the different soil areas of the State.

These facts relating to agricultural experimentation have been recounted here to show the estimate that is placed on the work, the provisions that are made for its support, and to suggest that though our Experiment Station, supported by government funds, does all the work it possibly can, the broad field of agriculture in the State can not be covered by it, and this Department must either come to the front and deal in a straight-forward and comprehensive sort of way with some of the agricultural questions or else allow our farming interests to fall behind those of other States, where more ample provisions are being made and where more strenuous efforts are being put forth for the development of the best possible methods and systems of farm practice.

It has been said that "The salvation of the State is in its farms." Eighty-two per cent of its population live in the country districts. Certainly, then, agriculture is deserving of the best intellect and the most powerful will. Mr. James J. Hill, one of the greatest of living financiers, and President of the 6,000-mile system of Union Pacific Railway, when asked, after the recent excitement in Northern Pacific stock had subsided, what interests have the most money and the greatest influence, answered: "The agricultural interests are the most important. They represent one-half the population of the United States, one-half the capital, and about all the patriotism and feeling there is."

There never was a time when there were more expenditures of means and effort than at present in the study of agricultural matters. Congress gave over four and one-half millions of dollars for the support of the National Agricultural Department this year, or more than one-half million over last year. I believe that this Department, in its small way, is beginning important work for the agriculture of the State and in the right way. Its work is specific; its plans definite. Its problem, as now outlined, is the development of the best methods for producing the best plans for the different soils and sections of the State; and it has gone to the specific localities and soils where it proposes to apply the results to propound the questions. This is in accord with the best and most recent plans of experimentation. The Kansas Legislature recently accepted a donation of a large tract of land in the



WHEAT FIELD IN CUMBERLAND COUNTY, N. C., ON FARM OF W. N. WILLIAMS.

western part of the State from the National Government and made a liberal appropriation, part of a $365,000 one for agricultural education and experimentation, to equip it for experimental purposes, because it is located in a different section with unlike soil, climate and agricultural conditions from those surrounding the main station in the eastern side of the State. Minnesota has three sub-stations in different parts of the State, Ohio and Michigan each two, California four culture stations away from the main one, and other States different numbers, simply because experience has shown it to be desirable, or even necessary, to obtain results under as nearly as possible the same conditions that it is proposed to apply them in practice.

It is then, I think, the part of common sense and wisdom that this Department has gone to the actual soil areas and sections to perform experimental work. And I now venture to suggest for the consideration of this board of practical and successful farmers that it might be desirable for you to own the farms on which you are operating, thereby laying a broader and firmer foundation for your work, adding to the purely experimental feature farming operations on such a scale as are capable of yielding revenue, and showing that the work is not merely of the plat and garden order, but that it is susceptible of the broadest possible application.

Under proper management, which I think the board is capable of supplying, I firmly believe that these farms, when once owned and reasonably equipped, would become self-sustaining or even remunerative; and with the addition to them of good grades of stock, suited to the section, and of grasses, clovers and other legumes for grazing and hay, the basis of cheap and increased productiveness of the land, I believe that these farms would become centers from which would go out better methods of farming, better breeds and variety of stock, and would furnish a practical education by observation to many who can not spare the time and means, at their stage of life, to obtain it at a regular educational institution. It may, at least, be worth your while to consider it. I must say that it is rather attractive to me, but I may be overly enthusiastic. I feel, though, that the time is ripe and the opportunity unsurpassed for this Department to become the authority and leader in agricultural matters in the State.

Ours is an important agricultural State. The lands of the East and Piedmont West, with the removal of stumps, are adapted to the best agricultural machinery, which permits competition with other seemingly more favored sections. We have seen the lands of Chadbourne advance from $1.00 to $4.00 per acre in three or four years. I am told that land values in the Middle West have advanced from 50 to 100 per cent in a very few years, and they are still cheap in comparison with the same lands elsewhere. Business men engaged in farming in the East and West tell me that the money they have invested in farming operations brings them better percentages than that in banks, factories, or other enterprises.

In view of these facts, I feel that agriculture has made and is making some progress, and that it offers, at least, a living for the future.

WHEAT RAISING AND STOCK BREEDING IN EASTERN NORTH CAROLINA.

This writer has long been impressed wth the wonderful capabilities in agriculture and stock raising of Eastern North Carolina. In general agriculture the soil responds to good treatment with generous yields of such a variety of crops as is unknown to other soils in the Middle and Western sections, or to the more fertile soils of the Northern and Western States.

The farmers of the East have long devoted their energies and their lands to the successful raising of cotton, corn, tobacco and peanuts, and have given but indifferent attention, at least since the war, to wheat culture. Yet, when efforts have been made they have been met with encouraging success.

Two instances will be given in this BULLETIN, which should convince the farmers of the East that they can raise wheat at a profit, and keep the money at home which annually goes into other States for their supply of flour.

A few years ago Capt. Jas. D. McNeill, of Fayetteville, now a distinguished member of the State Senate, having faith in the capabilities of his section to raise wheat, and at such a profit as would insure its production, boldly ventured to build a roller mill. This is the history of the enterprise as given by Capt. McNeill himself:

"FAYETTEVILLE, N. C., July 29, 1901.

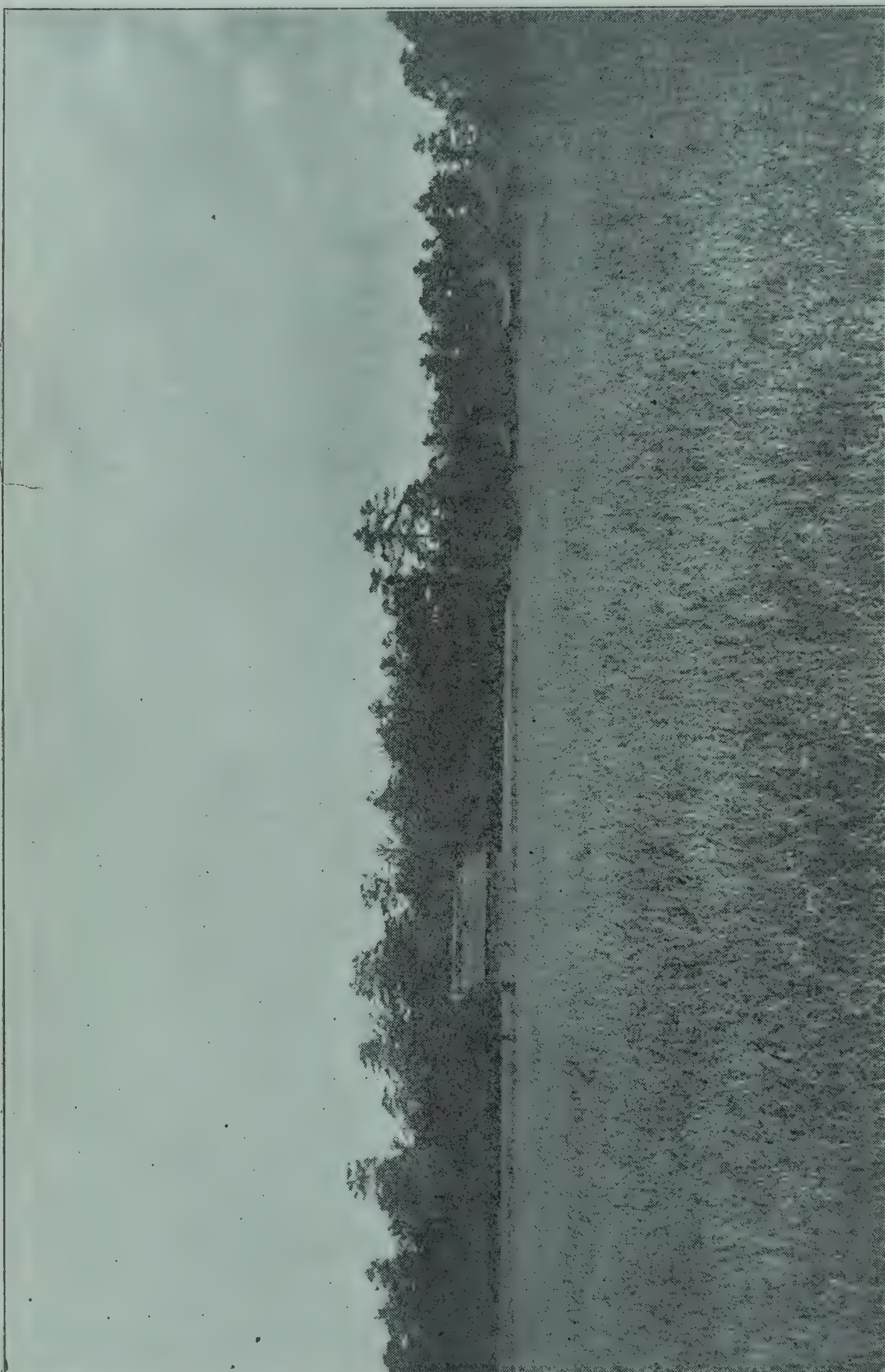
"I willingly comply with your request to write you a brief report of the wheat-growing interests in this section. Let me first say that our people appreciate the kind interest that you and Mr. Bruner are taking in our local affairs.

"Some twenty years ago there was considerable wheat raised in this and surrounding counties, but owing to the introduction of patent roller mill flour from the Virginia cities and the West, and to the further fact that our milling interests did not measure up to the situation and give to our farmers the advantages of high-grade flour *from their own wheat*, the raising of wheat was almost completely abandoned; so much so, that in 1897 there was quite probably not more than 200 bushels of wheat raised in Cumberland County. In the summer of that year I thoroughly advertised that, if the farmers would plant wheat, I would add an up-to-date roller mill plant to my 'Merchant Mills,' and also guarantee them good threshing facilities.

"The result has been that our farmers are now raising fine crops of wheat, as is demonstrated by the photographs of some of our wheat fields taken by Mr. Bruner. The industry is a growing one, and the yields even this year will compare quite favorably with any other section of our State, notwithstanding that the wet season in May was very damaging to a full yield. Our farmers are quite enthusiastic over the crops, and will continue to yearly increase the acreage.

"I am now giving them as good milling facilities as is enjoyed by any other people in the State. I do not exchange at all, but grind each patron's lot to itself and return the full grist in all its parts, less the toll taken from the wheat before grinding. This gives universal satisfaction.

"The first year, 1898, my roller mill had a patronage of about 6,000 bushels.



OAT FIELD ON TRUCK FARM OF MR. J. S. WESTBROOK, NEAR FAISON, DUPLIN COUNTY. YIELD, 50 BUSHELS PER ACRE.

In 1899 it increased to 12,480 bushels. In 1900 to over 15,000 bushels, and I think I will mill this year not less than 20,000 bushels of wheat, grown in this county, Robeson, Bladen, Sampson, Johnston, Harnett and Moore counties. Our farmers have fully demonstrated the fact that any of our cotton lands will grow fine wheat.

"Yours very truly, JAS. D. MCNEILL."

The other instance is one of farming. Last fall Mr. E. L. Daughtridge, member of the Legislature from Edgecombe County, and one of the most useful members of the Board of Agriculture, sowed 10 acres of land in wheat, after the cotton was picked. The cotton had been fertilized with about 300 pounds per acre of cotton meal, acid phosphate and kainit, *but no additional fertilizer was used* on the wheat. The cotton yielded about 1,500 pounds seed cotton per acre. The wheat yielded 30 bushels per acre. The land was turned 6 inches deep, wheat sowed about December 15th by hand, 5 pecks per acre, and put in with disc harrow. Mr. Daughtridge writes: "I did not make any special preparation for this crop. I knew the land was good and expected a fair crop, but did not expect 30 bushels per acre. I did not use any fertilizer under the crop. The land had been previously composted and had been seeded in peas several times. I have a large quantity of land of the same nature, equally as good. I am quite satisfied that our lands in Edgecombe, on Tar River, are as fine for any kind of grain or grasses as any lands in the State, and for stock raising and dairying, I am sure they can not be excelled."

And speaking of raising cattle, it is in place here to give an instance of its success, this also by Mr. Daughtridge. He has recently sold 12 steers, 2 years old, for $25.00 per head. These were grade Jerseys, raised by himself, which had been well wintered and put on grass, but were not grain fed.

The abundance and cheapness of material for winter forage ought to induce the breeding of cattle on a large scale in this eastern section. But I have already written more than intended at this time. Much will be said on these subjects hereafter; for, firmly believing in the success of wheat culture and stock raising, especially of cattle, mules and hogs and dairying in this favored region, the Department of Agriculture is going to devote much effort to induce the farmers to advance on these lines, and will extend to them all the aid and information in its power.

The assurance of good milling facilities would induce the production of more wheat—the assurance of more wheat would induce better milling facilities. If the farmers of a neighborhood will co-operate, they can secure both, and both will prove good investments. Capt. McNeill's remarkable success with his mill and the satisfaction to the farmers of eating bread made from their own flour, ground from their own wheat, raised on their own land, ought to induce the building of many mills and the fifty-fold increase of their wheat production.

THE GREATEST COUNTRY THAT THE WORLD HAS EVER SEEN—IT IS OURS.

Read what Secretary Wilson says of our agricultural productions and possibilities:

Secretary Wilson predicts the most glowing era in history for the agricultural interests of the country during the new fiscal year which has just begun.

Incidentally Mr. Wilson asserts that if the United States is given a few months more time any or all of the foreign nations of the world may form a commercial combine against the country with impunity. He says that before July 1 next this country, with its new possessions, will be raising and producing everthing that it uses, and that if we so elect we can furnish almost any other nation on the globe.

"We are now pushing investigations and experiments along a great many lines," said Mr. Wilson in an interview. "Our agricultural exports maintained their position in the fiscal year just closed, and compared with some years past increased appreciably.

"One of the principal objects which this Department has in view is to enable the people of the United States to produce the agricultural products we are now purchasing from foreign countries. During the year 1900, for instance, we bought half as much agricultural goods as we sold; that is to say, we sold about $844,000,000 worth and bought about $420,000,000 worth. The principal product we purchase from other nations is sugar. This commodity comprises nearly one-fourth of the total products imported. The Department in the past has been making experiments to ascertain in just what sections of the country sugar can be raised to such advantage as to obviate the necessity of going to foreign markets to complete our supply. We want to raise beets, as therein lies the principal source of the sugar product. Within the United States there will be over forty beet sugar factories in operation next fall. They will be situated in almost every State along the Northern border, from New York to California. I believe that within a few years we will produce all the sugar that we require, and we will then be in a position to ignore the foreign product. Our experiments have shown that the sugar produced from our quality of beet is much richer than that manufactured in foreign countries. Our product, therefore, will be much more desirable.

"When this result shall be attained the sugar trust will, in my opinion, vanish, for the reason that the trust refines imported brown sugar, while all the American factories will finish the product and place it in entire readiness for sale on the markets.

"We are now succeeding admirably in the production of tea in the United States," continued Mr. Wilson. "It is only a question of a short time when we shall be able to raise all the tea demanded for use in this country. The two tons of tea grown at Summerville, S. C., last year so well satisfied the New York investors interested in the industry that they immediately formed a syndicate and bought 6,000 acres of land in the State upon which tea will be grown. This Department last year sent tea plants to every Gulf State in

the Union from the Carolinas to California for experimental raising. We have just heard from South Carolina that imported machinery in use there is able to make green tea from the black product in one hour. We do not yet manufacture such machinery in this country, but we will get to that later. Then there is no question concerning the availability of labor when we get to growing our tea on a large scale. There is any number of young people will seek employment as pickers of the leaves, as wages will be good. We are now importing plants from China, Ceylon and Japan, and we purpose raising the highest grade of product in this country.

"Three years ago the Department began consideration of the rice cultivation in the United States. At that time we produced about 25 per cent of what we consumed, and when we examined the situation we found that there was a demand for a much better grade of the product than was being grown here. We sent an expert to Japan to look over the field, and this man found just what we were looking for. The result is that next year we will grow an excellent grade of rice—a class, in fact, that will equal that of any other nation producing the grain.

"The Department is just now also busily engaged in consideration of a diversity of interests which are to be promoted in our new possessions. We have found upon investigation that the people of the new lands need agricultural instruction and encouragement. This we propose to give them to the best of our ability. For instance, we must be able to produce large quantities of hay in the Philippines to feed the 13,000 horses and mules which the United States is now maintaining there. The demand for fodder is far in excess of the home supply, so that it has been found necessary to import the product. This ought not to be. There is ample opportunity for raising hay and other food products for horses and cattle in the Philippines, and steps will be taken to relieve the situation.

"Coffee is another product which we are looking after. Our scientists are investigating the coffee outlook in our insular possessions, and we expect to accomplish something during this fiscal year which will greatly encourage the industry.

Several years ago this Department began to collect specimens of rubber. At present the United States buys annually $30,000,000 worth of rubber, but the outlook is that we will now be able to raise in our new possessions every bit of the product needed. It will be produced in Porto Rico, Hawaii and the Philippines, and the result will be that people using the commodity will be able to save many thousands of dollars in its purchase. Then there is the subject of macaroni wheats to be considered. The macaroni which we have been manufacturing here in the past is not quite equal to the Italian product, but we are on the right track, and it will not be long before we will be able to produce a grade that will be superior to that imported from Europe. The semi-arid regions of our country are adapted to the growth of macaroni wheat, and all of the 15,000,000 pounds of the product which we now consume, and which comes mainly from Italy, will be shortly grown upon home ground.

"As for spices our new possessions will furnish us with an abundant quantity as soon as we can get the machinery of their production in full operation.

"Another important matter being considered by the Department is the cross breeding of cottons, which operation, when completed, will result in the establishment of the fine grade of the product which we are now bound to import from Egypt. About $5,000,000 worth of this refined commodity finds its way here from that region every year, but after we have finished our experimental work in this direction we hope to be able to arrive at a combination which will be able to produce a class of cotton goods as acceptable as that from the region of the Nile.

"There is no doubt that this country, within a few months, will be in a position to ignore every other nation on the globe in the matter of food products. We will produce within our own domain everything that goes upon our table and upon our backs. We will then be, commercially and industrially, almost independent of the other nations of the world. Hence any trade combination which may be effected against us will count for nothing. Whenever we get ready we can come pretty near starving any other nation. Therefore, an effective combination against us will be an impossibility."—*Cotton Planters' Journal.*

NOTE:—To prevent duplication, the industrial statistics for August, 1901, are omitted.

NOTES ON DRINKING WATER.

BY GERALD McCARTHY, BIOLOGIST.

1. The diseases most often transmitted by polluted drinking water are typhoid fever, cholera, spotted fever, dysentery and acute and intestinal colic, also hog cholera, chicken cholera and anthrax.

2. A pure and reliable water supply is the first requisite for continued good health. Shallow, open wells are very dangerous. The dug well is now obsolete, and should be, whenever practicable, abandoned for the driven or bored well. These wells have a casing of galvanized iron. They should never be less than 100 feet deep.

3. Where dug wells are continued in use a pump should be used rather than a bucket. The platform over the well should be water-tight. The casing of stone or hard brick should extend at least two feet above the level of ground. It should be covered with good cement inside and out.

4. Rain or surface water should not flow towards a well from a stable, pig pen, privy, or any such place. None of these should be located, nor should kitchen or chamber slops be deposited on the ground, within 150 feet of any well or spring.

5. Dug wells should be pumped or bailed dry and all sediment down to original bottom removed at least once a year. The inside of casing should be carefully examined and all cracks filled with cement or mortar of good quality. Wash the inside of casing with a saturated solution of copperas once a year.

6. The use of cistern or rain water for drinking is not safe in localities where the English sparrow or the common pigeon abound. These birds defile roofs with their excrement and also carry thereupon polluted materials, such as straw, rags and waste paper. The use of shallow pools, miscalled "springs," is also dangerous, as the water which collects in these pools is from surface of ground and may contain disease germs.

7. The use of patent household filters is not recommended unless they can be and are frequently and thoroughly cleaned and disinfected by boiling. An unclean filter pollutes the water.

8. When a drinking water is suspected of beiog polluted, before using it should be heated to 170 degrees F. for 10 minutes, or *boiled* for 3 minutes. These temperatures for the times given are fatal to all pathogenic bacteria. The "flat" taste of boiled water can be removed by pouring the water a few times from one vessel into another held two or three feet below.

9. Hogs or other animals should not be permitted to drink water polluted by their own excrement. Hog cholera, anthrax and other deadly diseases are propagated in this way.

10. Cattle suspected of tuberculosis should not drink out of a trough or bucket used by other animals. Such suspected animals should be kept separate and fed and watered out of special utensils.

11. Polluted water is probably the cause of more disease on the farm than any other agency.

12. Moral: Use clean, wholesome water for man and beast.

LUCERN VALUABLE FOR FOOD.

An experienced farmer in Mecklenburg County says he has planted a lot of one acre in lucern and has found it most profitable. He says one acre will grow enough to feed eight horses during the season without any corn. One sowing will last from ten to twenty-five years, and the land continues to improve all the while. The western farmer raises lucern to feed his stock and ships his corn South. Several of our farmers have been experimenting with lucern and some have found it most profitable. The greatest difficulty is in getting a stand.—*Shelby Star.*

HOW TO GET A STAND.

Examples of legumes are cowpeas, all the clovers and vetches, alfalfa, lespedeza, peanuts, beggar weed, velvet beans, and garden or English peas. Nearly all other crops commonly cultivated in the South are non-legumes, for example: cotton, tobacco, corn, the small grains, sugar cane, and all grasses and grasslike plants. * * *

I speak of a discovery of momentous importance. It is not legumes that were recently discovered; they have been with us always. I allude to the discovery of the characteristic and most important function of legumes, viz., their ability to draw nitrogen from the limitless stores of it in the atmosphere and to transfer it, by their decay, to the soil in which they grew. * * *

As previously stated, there are on the roots of useful leguminous plants a number of enlargements, tubercules, or nodules, varying in form and size with the kind of plant to which they are attached. Those on the cowpea are, at maturity, about the size of a pea; those on beggar weed and peanuts somewhat smaller; those on velvet beans as large as the point of the finger, and the clusters of tubercles on the roots of vetch and alfalfa are as large as a hickory nut. The larger and more abundant these tubercles the more rapid the process of transferring nitrogen from the air to the legume. These root tubercles are in effect fertilizer factories, manufacturing the highest grade of ammoniated fertilizers. They are inhabited by multitudes of bacteria, which may be said to be the operatives in the fertilizer factory. The nitrogen, after being changed by these microscopic organisms from useless gaseous nitrogen into a form acceptable to plants, is carried by the sap into every portion of the plant to which the tubercles are attached, thus building up leaves and roots and stems and fruits with nitrogenous tissue—the material which constitutes the richest of forage and, if allowed to decay in the soil, the strongest of fertilizers.

When clover roots rot in the ground this bacteria, borne by the drainage water or otherwise, become distributed throughout the soil. So the soil of an old clover field is not a dead thing. It is swarming with microscopic forms of life, prominent among them the special bacterium which has the power to organize new tubercles or fertilizer factories on the roots of the next crop of clover seedlings.

By experiments made it was learned that in most soils neither clover nor vetch nor alfalfa had tubercles on the roots. As a result the plants grown

in these experiments were decided failures—small, yellow, and doomed to early death. It was evident that many of those soils were not in the natural condition fit for clover, nor would they constitute a promising stock country if these forage plants must be dispensed with. It was apparent to your speaker, who conducted the experiments, that suitable bacteria for the production of tubercles on vetch, alfalfa and clover were wholly or almost entirely absent on most of our non-calcareous soils.

We determined to supply the desirable bacteria, and our first experiment was crowned with most astonishing success. A field of vetch, sown in the fall of 1896, part with seed in their natural condition, and part with inoculated seed, that is, with seed to which vetch-bacteria had been made to adhere by bringing seed and old vetch soil into contact, presented a marked contrast in growth. The untreated seed afforded a growth too small to be cut, except with a sickle, the yield being only 232 pounds of hay per acre. Alongside, inoculated seed, which had been dipped into a thin mixture of water and earth from an old vetch field, yielded 2,500 pounds of hay per acre.—Prof. J. F. Duggar.

The same process is recommended for lucern. In fact all legumes should be treated in this way just before being sown on new or uninoculated soil.

THE POISONOUS PLANTS OF NORTH CAROLINA.

BY GERALD McCARTHY, BOTANIST AND BIOLOGIST.

No. 1.—BEAR CORN.—INDIAN POKE.—*Veratrum viride.*

Bear Corn is a perennial herb of the colchicum tribe of the lily family. It grows from three to six feet tall, flowering in April and May. Common in the wet valleys and coves of the mountain region. The leaves are simple, broadly oval, six to ten inches long at ground, but decreasing in size from the ground upwards, acute at tip, clasping stem at base and strongly plaited in middle. The flowers are dingy white, greenish yellow, or occasionally purplish brown. Very numerous in a panicle at top of stem. The root is a rather thick and fleshy rhizome four or five inches long. The poisonous principle is a bitter alkaloid, which is most abundant in root. The powdered root is used as an insecticide, especially for the worms which attack the currant and gooseberry. The poison is very violent and rapid in its action. As the plant shoots early in spring, cattle eat the shoots in absence of other food. Children often pick and eat the seeds. It is generally impracticable to save stock poisoned by this plant. Lard heated to the melting point and poured down the animal's throat—one to two pints, according to size of animal—is the best treatment. Persons poisoned by this plant should receive first an emetic of mustard or sulphate of zinc and then tannic acid, followed by copious draughts of black coffee or diluted whiskey. All lily-like weeds should be exterminated from pasture.

No. 2.—BITTER OR SNEEZE WEEDS.—*Helenium* (two species).

Helenium Autumnale, or autumn bitter-weed, is a perennial herb of sunflower family, two to four feet tall, growing in swamps and along river banks, chiefly in the eastern and middle sections of North Carolina, the leaves are rather thick and rough, green, lance shaped, acute at tip, and decurrent on stem. The flowers, appearing in August, are composite, yellow, with yellow, toothed, pistilate rays. They are borne singly at tips of branches.

Helenium tenuifolium—the narrow-leaved bitter-weed—is an annual herb, usually growing on banks and along road-sides in the eastern district of the State. The stems are one to two feet tall, very leafy, much branched. Leaves very narrow. Flowers, appearing in August, are yellow, very like those of the autumn bitter-wed. They are borne on long leafy stalks at the tips of branches. The poisonous principle of both of the bitter-weeds seems to reside in the flowers, which, when eaten, cause burning pains in stomach and violent sneezing when inhaled. The large-leaved sneeze-weed is considered more violent than the small leaved, but both are dangerous. The entire plant is hot and bitter. It is not at first eaten by animals on this account, but eventually they get to like it, and then seek it with avidity, especially sheep. When it does not poison the animal outright, it gives a peculiar and bitter taste to the flesh and milk, rendering these worthless for the time

being for consumption. Horses and mules are more liable to serious injury from these weeds than are sheep and cows. In horses and mules the bitter-weed poison produces the disease called "blind staggers." The effects are seen very soon after the animals have eaten the poison. The animals plunge about in a blind, aimless and violent manner, eventually falling with head drawn under the body, often breaking the neck. Remedy:—Lard heated just

FIG. 1.—AUTUMN BITTER WEED.
From Chestnut—U. S. Depart Agr.

FIG. 2.—NARROW-LEAVED BITTER WEED.
From Chestnut—U. S. Depart. Agr.

warm enough to melt. Pour a pint or two down the animal's throat from a long-necked bottle. The remedy must be administered as soon as possible after the symptoms of poison appear. These weeds, with field garlic, may be considered the three worst pasture weeds of the eastern and central sections of the State. The narrow-leaved species can be easily destroyed by mowing it often enough to prevent its maturing seed. The large-leaved sneeze-weed must be cut off below the ground just as it is coming into flower, or during July. The name *Helenium* refers to Helen of Troy.

No. 3.—BLACK CHERRY.—*Prunus serotina.*

The black cherry is a tree 30 to 50 feet high. The bark, especially of branches, is reddish brown. The leaves are oval, bright green, rather thick,

and glossy on upper surface, tapering to a slender point at tip. The leaf stalks have one or two reddish glands. The edges are toothed with incurved teeth. The flowers are small and white, borne in rather long racemes, appearing in April and May. The ripe fruit is globular, purple, black. The bark of the black cherry has a great reputation as a stomach medicine and tonic. It is largely used by pharmacists. The fruit is used to flavor various distilled liquors. The poisonous part of the tree is the leaves and in the kernels of the seeds. The poison is hydrocyanic or prussic acid. This does not exist ready formed in the leaves, but is produced by the beginning of decay or drying up of the leaves in the presence of water. Cows are the animals most frequently poisoned by browsing on cherry branches. The symptoms are intoxication and convulsions, soon ending in paralysis and death. Death is so rapid that treatment for animals is scarcely practicable. Where children are poisoned by eating the fruit kernels, an emetic—see formula for sulphate of zinc—should be used, and a physician called in all possible haste. Branches or twigs of the wild cherry should not be thrown where animals may get at them. The cherry laurel, or mock orange, *Prunus Caroliniana,* much used as an ornamental tree in the coast counties of North Carolina, is also poisonous in same way as the above-described species.

No. 4.—Black Night Shade.—*Solanum nigrum.*

This is an annual herb of the tobacco and Irish potato family. The stem is usually erect, branching, 1 to 3 feet high. The leaves are oblong, 3 to 4 inches long, usually toothed, halberd shaped. The flowers appear from July to September. They are small and white, and are borne in a bunch at the top of long, leafless stemlets. The ripe fruit is round, juicy and black. The poisonous principle is an alkaloid, *solanine*, which is found in every part of the plant. It is a narcotic poison like nicotine. The animals most frequently poisoned by black night shade are hogs, goats and calves. The remedy for animals is a purgative like linseed oil or epsom salts, followed by a stimulant such as whiskey. These plants are easily exterminated from pastures and road-sides by cutting down before they have matured seed.

No. 5.—Buck-Eye.—*Aesculus pavia.*

The red buck-eye is a shrub from 8 to 10 feet high, growing in rich, moist ground containing lime or marl. The leaves are compound, composed of 5 long, lance-shaped saw-tooth edged leaflets at the tip of a long leaf stalk. The flowers are red, and appear in March and April. The fruit is smooth, glossy and reddish brown. The poisonous principle is a bitter alkaloid, *esculin*, related to *saponin*. It is most abundant in the seeds and young leaves. The bruised twigs thrown into a fish pond have frequently killed every fish in the pond. Cattle are often killed by eating the leaves and seeds. Boiling with several changes of water seem to remove the poison from the seeds. The seeds of the red and other buck-eyes, and of the horse chestnut are used by pharmacists. They have a commercial value. The roots, when put into a wash-boiler with clothes, serve same purpose as soap. The symptoms of poisoning by the buck-eye are diarrhœa, vomiting, and spinal irritation. Remedies: Melted lard, Potassium permanganate. Digitalis. See chapter on general treatment.

No. 6.—BOUNCING BET.—*Saponaria officinalis.*

Bouncing Bet is a well-known garden perennial flowering plant which has run wild in spots near houses. The stems are smooth and short, 1 to 2 feet high. The leaves are oval, 3-ribbed, opposite on stem and joined together at base. The flowers are large, white or pinkish, growing in clusters, appearing in July and August. The poisonous principle is a soapy, acrid alkaloid, *saponin.* It is found in root, leaves and seeds. Poisoning by this plant is not very common, as the taste is disagreeable to animals. But it is desirable to prevent the plant from establishing itself in waste grounds.

No. 7.—CORN COCKLE.—*Agrostemma Githago.*

Cockle is a well-known showy annual weed in wheat fields. The stem is one to two feet high, clothed with long white hairs. The leaves are long, very narrow and densely hairy. The flowers are blue-red, very showy, borne at the tips of long stalks. The seeds are somewhat kidney-shaped, black and very rough or warty. The poisonous principle is *saponin*—the same as in bouncing bet. Poisoning by cockle is usually caused by eating the seed, which is nearly always present in uncleaned wheat; chicken feed, bran and shorts nearly always contain cockle seeds, often in very large quantities, and animals have been killed by eating such feed. More commonly the poison acts slowly, producing general decline. The disease Githagism, caused by cockle is, however, not very violent and is apt to become chronic, like lead poisoning. The symptoms of poisoning by cockle are general irritation of the digestive tract, and eventually a decline ending in paralysis. Remedy for acute poisoning: A water solution of permanganate of potassium (see chapter on General Treatment) and digitalis, taken hypodermically. Owners of stock should not buy or use feed containing cockle. The presence of cockle in bran, shorts and flour is easily determined by microscopic examination.

No. 8.—ERGOT. SPURRED RYE.—*Claviceps purpurea.*

Ergot is a fungus which attacks the growing seeds of rye, wheat and numerous grasses. When such damaged seed is eaten in any considerable quantity by animals or humans, symptoms of slow poisoning eventually appear. These are principally oppressions of stomach, diarrhœa, burning thirst, pains in feet and convulsions. If the use of ergotted grain or flour is long continued, the feet are eventually attacked by gangrene and drop off. The remedy for ergot poisoning is first an emetic or purgative, then whiskey followed by strong hot tea or a weak solution of tannic acid. External warmth should be maintained by means of blankets wrung out of hot water. Ergot in growing grain or grasses is most abundant on wet soils.

No. 9.—INDIAN TURNIP.—*Arisaema triphyllum.*

The Indian turnip is a tuberous rooted, stemless, perennial herb about a foot high, growing in rich moist woods throughout North Carolina. The plant has two compound leaves, each composed of three leaflets. The flowers appear in February and March. They are borne on a long stalk or scape springing from root. A greenish-white or purplish, nodding, hood-like spathe

or envelope surrounds the flowers. The fruit is a scarlet berry. The root resembles a medium-sized flat turnip. When fresh it is intensely acrid. It has caused many deaths. When the root has become dry it may be ground and then boiled or baked. It is wholesome when cooked, and is eaten by the American Indians. The leaves are also poisonous, and sometimes eaten by animals in spring when other green food is scarce. The symptoms of poisoning are intense irritation in stomach and bowels, headache and convulsions. Remedy: First, an emetic, then laudanum, or morphine and whiskey.

No. 10.—JESSAMINE.—*Gelsemium sempervirens.*

The Carolina, or yellow jessamine, is an evergreen woody vine with long, purplish, glossy, twining stems. Grows in rich moist woods in the low and middle districts of North Carolina. The leaves are opposite on stem, with short stalks. The flowers appear in March and April in clusters from axils of the leaves. They are yellow and very fragrant. The root is much used in medicine, but is dangerous in unskilful hands. One-half fluid ounce of the decoction is fatal. The flowers are the part most commonly injurious, as they are gathered for their odor. The symptoms of poisoning by *Gelsemium* are narcotism and paralysis. The most common and characteristic symptom is dropping of the jaw, dizziness and imperfect vision. Remedy: First, an emetic, then morphine and whiskey; hot blankets.

FIG. 3.—JIMSON WEED.
From Chestnut—U. S. Depart. Agr.

No. 11.—JIMSON WEEDS.—*Datura tatula and D. Stramonium.*

The Jimson, or Jamestown, weeds are coarse, rank-smelling annuals, commonly found on waste ground and fields where stable manure has been deposited. They have thick, narrow, much-branched, greenish or yellowish herbaceous stems. The leaves are oval and sharply toothed, on short stalks. The flowers are white or purplish, usually borne singly in the forks of the branches. All parts of these plants are poisonous, more especially the leaves and seeds. Children are frequently poisoned by eating the seeds. The symptoms of poisoning by these plants are dryness of mouth, brightness and dilation of eyes, flushed face and delirium, followed by stupor and death. Remedy: First, an emetic, then strong tea or tannic acid solution, soon followed by castor oil; later give whiskey.

No. 12.—LAURELS. ROSE-BAY.—*Rhododendron. Maximum, etc.*

All the evergreen broad-leaf plants of the laurel family or *Ericacea* are more or less poisonous, but those which have caused serious losses are chiefly found in the genera Rhodendron, Azalea and Kalmia. Rhododendron maximum, the rose-bay of North Carolina mountain and Piedmont country, is a thick-leafed evergreen shrub about 10 to 15 feet high. It grows only on rich soil in woods, on the banks of streams. The leaves are 4 to 11 inches long, oblong, smooth, with sharply pointed tips. The flowers are white or rose-colored. They appear in July. There are two other species growing on high mountains, viz: *R. Catawbiense*, Oval-leafed Laurel, 3 to 6 feet high, with purple flowers, appearing in June. Leaves 3 to 5 inches long. *R. punctetum*, Dwarf Laurel, 4 to 6 feet, with spotted, rose-colored flowers. All the Azaleas are now classified under Rhododendron and probably possesses the same poisonous principle—*Andromedotoxin.* This seems to be most abundant in the buds, leaves and flowers. The symptoms of poisoning by the laurels are nausea, frothing at mouth, dizziness, staggering, stupor and death. Cattle, calves and sheep are the most common victims. Remedies: Melted lard, one or two pints, poured down the throat of animals, followed by strychnine or atropine. The two latter should be administered by a physician only. A decoction of the leaves or, better, spring buds of the laurel, is sometimes used with good results as a wash for ulcerated feet. The different laurels described as Nos. 13, 14, 15 and 16, all possess the same properties and should be treated alike. All these plants should be exterminated from pasture grounds.

No. 13.—DOG LAUREL.—*Leucothoe catesbaei.*

The dog laurel is an evergreen shrub, 2 to 4 feet high, growing in the mountains of North Carolina. The leaves are alternate on stem, sharply tipped, lance-oval, on long stalks. The flowers are white, in dense racemes from axils of leaves, appearing in March and April.

No. 14.—SHEEP LAUREL.—*Kalmia latifolia.*

The sheep laurel, also called Ivy laurel and calico bush, is one of the most abundant and handsomest shrubs of the mountain region of North Carolina. It also occurs in the middle country and, to a much smaller extent, in the coast region. Height, 5 to 10 feet. The branches are smooth, leaves thick,

evergreen, acute at both ends, on short stalks. The flower is large, odorless, white with rose-colored spots, or deep rose-color, appearing in May and June.

FIG. 4.—SHEEP LAUREL.
From Chestnut—U. S. Depart. Agr.

FIG. 5.—WICKY LAUREL.
From Chestnut—U. S. Depart. Agr.

No. 15.—WICKY, OR LAMB LAUREL.—*Kalmia angustifolia.*

The wicky laurel is found in all parts of the State. It is a low shrub, 2 to 3 feet high, usually growing in shady thickets on banks of streams. The leaves are evergreen, small and narrow. The flowers are in clusters, viscid or sticky and deep rose-colored, appearing in April and May. Much smaller than the flowers of the sheep laurel and never white.

No. 16.—CALF LAUREL.—*Andromeda mariana.*

The calf laurel, also called stagger bush, grows 2 to 4 feet high, in damp, gravelly soil, in the low and middle districts of North Carolina. The leaves are deciduous, thin, oblong, two to three inches long. The flowering stems are commonly leafless. The flowers are white and rather large. Appear in April and May.

No. 17.—LARKSPURS.—*Delphinium tricorne, D. azureum, D. exaltatum, and D. consolida.*

There are four species of larkspur more or less common in North Carolina. All are easily distinguished from other genera of plants by their blue, spurred corollas. The three first named above are native plants. The last is the common garden larkspur which has escaped and is growing wild in many localities. All the larkspurs have finely-lobed leaves on long stalks. The flowers are blue, borne in a long raceme at top of stem. The native species

are perennials. All the larkspurs are more or less poisonous, but *D. tricorne*, called "Stagger weed," is our most noxious species. This grows about one foot high from a tuberous root. The flowering stems bear 6 to 12 deep-blue flowers. The poisonous principle is *delphinine*, a bitter alkaloid which is especially abundant in the flowers. The symptoms of poisoning by larkspur are violent purging and vomiting, followed by numbness and stupor. Remedies: Melted lard for animals. For humans, an emetic, followed by a solution of tannic acid, then whiskey and digitalis or nux vomica. These plants should be exterminated from pastures. Children should be instructed not to chew the flowers or weeds, which they often do under the name of "Indian tobacco."

No. 18.—POISON COWGRASS. ZYGADENE.—*Zigadenus glabberimus.*

Zigadenus glabberimus is one of the commonest plants growing on the savannahs of the coastal plain of North Carolina. It belongs to the colchicum tribe of the lily family, nearly all of which tribe is poisonous. The poison cowgrass is a perennial herb about 3 feet high. The stem is very smooth, unbranched. The leaves are grass-like, but broader, and decrease in length towards top of stem. The flowers are white, about one inch in diameter, in crowded panicles, appearing in June and July. Another species, *Z. leimanthoides*, much resembling the above, but somewhat more slender and taller, with swollen base, occurs in the mountain region, flowering in July and August. The roots of all the zygadenes are tuberous or rhizomes. The poisonous character of these two zygadenes is largely conjectural, based upon the known character of other species of this genus, which are common in the Northwestern States, where they are called Death Camas. It is sufficient to refer to these plants here with a caution to be on guard against them. Remedy: For animals, a strong and quick purgative, followed by a heavy dose of tannic acid solution. (See under General Treatment further on.)

No. 19.—POKE WEED.—*Phytolacca decandra.*

The poke weed is a tall, stout, succulent, strong-smelling perennial herb, 4 to 8 feet high. Leaves oval, lance-shape, acute at tip, on long stalks. Flowers appear in July and August, white, in long racemes opposite the leaves. Berries black, filled with crimson juice. The root is large and very poisonous. There is some doubt as to the poisonous nature of the berries and stalk, but none as to the poisonous character of the roots. The nature of the poke poison has not been determined, but it acts as a spinal convulsant, resembling the action of water hemlock. Remedies: Emetic, tannic acid, followed by laudanum, whiskey and potassium bromide. This weed is most commonly found in the margins of cultivated fields and where brush has recently been burned. It should be exterminated.

No. 20.—RATTLE-BOX.—*Crotalaria saggitalis and C. ovalis.*

The *Crotalarias*, or rattle-boxes, are low, 4 to 12 inches, leafy herbs of the pea or legumine family. The first-named species is annual, the second is perennial. The leaves are simple, about 2 inches long, hairy, oval or oblong, on short stalks. The flowers are yellow, appearing from May to July, in racemes opposite the leaves. The fruit is a swollen capsule or pod which becomes black, leather-like when dry. The loose seeds rattle in the dry pod or box. Grows abundantly on sandy, dry soil. The poisonous principle is not

well known, but is probably similar to *lupinin*. It occurs abundantly in the leaves and seeds. Stock are frequently poisoned by eating the dry or withered leaves and stems during winter or in dry summers when other herbage fails. It also occurs in swamp hay. The symptoms of poisoning by *crota-*

FIG. 6.—RATTLE BOX.
From Chestnut—U. S. Depart. Agr.

laria are stupor and difficult breathing. Chronic poisoning by small doses causes a gradual decline. Remedies: Epsom salts, whiskey, with wholesome food. Pastures and meadows where the rattle-boxes or lupines occur should be burned over in the fall to destroy the seeds of the plants. The lupines are botanically closely related to the rattle-boxes, and possesses the same or similar character.

No. 21.—ROSIN WEED. CONE FLOWER.—*Rudbeckia laciniata.*

The rosin weed is a tall, 4 to 6 feet, perennial herb of the sun flower or composite family. The stems are smooth, much branched, each branch being tipped with a flower. The leaves are large and rough, variously lobed or cut, the uppermost being entire. The flowers appear in July and August. They have long, yellow ray flowers, which are sterile. The central or disk flowers are yellowish or purple. The seed are three-angled, and are borne on a cone-like disk. In North Carolina this plant is common in swamps and along streams. It has been suspected of poisoning hogs. In the Western States it

has caused the death of sheep eating it. The poisonous principle is not known. Remedies: Melted lard, one to two pints, poured down the animal's throat.

No. 22.—SPURGES—WOLF'S MILK.—*Euphorbia, many species.*

About 15 distinct species of the genus Euphorbia or spurge occur in North Carolina, most of them in the coast and middle regions. All of the spurges possess an acrid, milky juice which is a powerful blister, emetic and purgative. In overdoses it is a poison, acting as an irritant to the stomach and bowels. The most important species of spurge growing in North Carolina are the following:

E. Corrolata.—Flowering spurge, a perennial, short-branched, smooth herb, 1 to 2 feet high, growing in dry soil. Leaves alternate on stem, but opposite or whorled on branches, small, narrow, green, entire edged, appearing in July. Flowers imperfect and destitute of true corrolla, but surrounded with showy white leaves resembling petals.

E. Ipecacuanhae.—WILD IPECAC.—A perennial, low, 2 to 8 inches high, smooth herb with very long, slender roots. Leaves very small and smooth opposite on stem and branches. Flowers in fork of branches, with dark-purple involucres, appearing in May, are borne on long stalks.

E. Maculata.—SPOTTED SPURGE.—An annual, prostrate, silky or hairy herb, with stem 6 to 12 inches long. Leaves toothed, oblique at base, green, generally spotted with purple. The flowers appear from June to October. Small, in crowded clusters near tips of branches.

E. Marginata.—SNOW-ON-THE-MOUNTAIN.—A tall, erect, annual herb. Stems hairy, stout, 2 to 3 feet high. Leaves without stalk, light green, margined with white. Flowers imperfect, with an involvere of petal-like white leaves. This species is commonly cultivated for ornament in old gardens on account of its showy leaves. These plants are all dangerous, and should not be carelessly handled. Remedy: For blisters, sugar-of-lead. For internal poisoning, tannic acid, followed by whiskey and laudanum.

No. 24.—THE SUMACHS.—*Rhus, many species.*

There are seven species of sumach in North Carolina, of which three are poisonous. All three are shrubs, with milky, acrid, poisonous juice. The odor of sumach is poisonous to many people.

R. Venenata, or *Vernix.*—POISON ELDER.—The poison elder is a smooth shrub, from 8 to 12 feet high. The leaves are compound and pinnate or feather-shaped. The leaflets are 7 to 13 in number, oval or oblong, sharp tipped. The flowers appear in July. Small and greenish, in erect panicles on long stalks. Fruit whitish, smooth.

R. Toxicodendron.—POISON OAK.—POISON IVY.—The poison oak or ivy is a trailing or climbing vine, usually climbing by rootlets over trees and fences. The leaves are compound, trifoliate. The leaflets are variously lobed, and more or less hairy. The flowers are imperfect, in loose panicles in axils of leaves. The fruit is whitish.

FIG. 7.—POISON ELDER.
From Chestnut—U. S. Depart. Agr.

FIG. 8.—POISON OAK.
From Chestnut—U. S. Depart. Agr.

R. diversiloba—POISON VINE.—This is a variety of the preceding, with deeply-lobed leaflets. The vine grows larger and climbs higher than poison oak.

R. pumila—DWARF SUMACH.—The dwarf sumach is a low or prostrate shrub with branches and leaf stalks very woolly. Leaves compound. Leaflets, 11 to 13, oval or oblong, sharp-tipped, coarsely-toothed. The flowers are imperfect, in a compact panicle at end of branches; fruit is red and hairy.

FIG. 9.—POISON VINE.
From Chestnut - U. S. Depart. Agr.

All of the poison sumachs act as irritants to the skin, and as narcotics when taken internally. The symptoms of external or skin poisoning by sumach are redness and eruptive blisters. Internal poisoning is indicated by stupor, followed by vomiting, convulsions and delirium.

Remedies:—For skin poisoning, a solution of sugar-of-lead in water or whiskey, and laudanum. For internal poisoning, an emetic, followed by a little bicarbonate of soda, honey and whiskey.

THE TOADSTOOLS.—*Agaricus* and *Phallus*.

There are about one thousand different species of fleshy fungi, commonly called mushrooms, or toadstools, native in North Carolina. Over one hundred

of these are edible and wholesome. Most of the remainder are inedible, because too tough or too small. Some fifty or more species are distinctly poisonous. Of these, only the species most common and violently poisonous will be described in this paper.

Agaricus (Aminita) phalloides.—POISON TOADSTOOL.—This is a large, fleshy, fœtid, umbrella-shaped mushroom, with white, buff or greenish, warty, viscid cap, 2 to 3 inches in diameter. Thin, spore-bearing plates or gills beneath cap. Spores white. The stem is hollow, with a collar or ring beneath the cap and a volva or sack surrounding the swollen base. Grows on the ground in damp woods. Appears in late summer. Common and very poisonous.

Agaricus (Aminita) excellsus.—BROWN TOADSTOOL.—A long, tall, 6 inches, fleshy, umbrella-shaped mushroom, with a brown, warty, viscid cap, four inches in diameter. Thin plates or gills. Spores white. Stem long, thick, hollow, stuffed with cottony fibres, scaly. Collar near top of stem and volva at base.

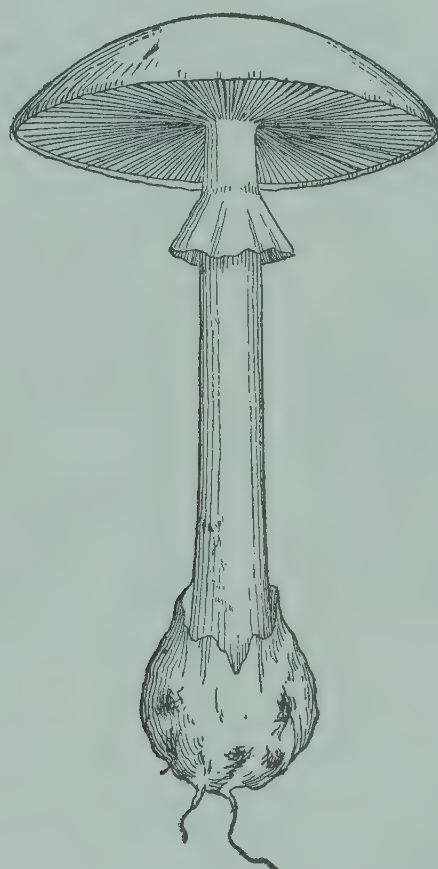


FIG. 10.—POISON TOADSTOOL.
From Chestnut—U. S. Depart. Agr.

Agaricus (Aminita) vernus.—DEATH CUP, SNOWY TOADSTOOL.—A medium-sized, snow-white, viscid, umbrella-shaped mushroom, appearing very early in spring. Stem hollow and stuffed with fibers. Base bulbous. Large, loose collar and volva. Very poisonous.

Agaricus (Aminita) muscarius.—SCARLET FLY-CAP.—A large, fleshy, umbrella-shaped mushroom, with a brilliant, scarlet, warty, viscid cap, striate

near edge, 3 to 7 inches in diameter. Gills and stem white. Spores white. Large collar on stem and volva, surrounding a bulbous base. Appears in late summer. Grows on ground in damp pine woods. Very poisonous. Common.

Agaricus (*Aminita*) *Mappa.*—PRIMROSE SORCERESS.—A large, fleshy, primrose-yellow, or whitish, umbrella-shaped or flat-capped mushroom. Cap warty when young. When old, cap becomes flat and smooth. Stem hollow or stuffed with fibers, bulbous at base. Collar and volva present. Grows on ground under trees. Common.

Agaricus (*Tricholoma*) *Sulphureus.*—YELLOW SNAKE.—A medium-sized, sulphur-yellow, fleshy, umbrella-shaped mushroom. Stem silky when young. Strong scented. Cap 1 to 2 inches in diameter. Gills notched next to stem. Spores white. No collar or volva. Appears in summer. Grows on ground in moist woods. Very common.

Phallus impudicus.—STINK-HORN.—A large, fleshy, columnar, white mushroom, 6 to 8 inches high, with a deeply-reticulated, conical cap, which is perforated at top and closely pressed, but not adherent to stem. No collar, but a volva surrounds the bulbous base. Odor very strong and fœtid. Grows on ground in oak woods. Very poisonous.

FIG. 11.—WATER HEMLOCK.
From Chestnut—U. S. Depart. Agr.

WATER HEMLOCK, COW PARSNIP.—*Cicuta maculata.*

The cow parsnip, or water hemlock belongs to the carrot family of plants, easily recognized by their umbrella-like flower clusters, their striated stems

and seeds, and strong, peculiar odor. Cicuta is a large, stout marsh plant, growing 3 to 6 feet tall, with smooth, purplish, hollow stems. Leaves twice pinnately compound. Flowers white, in large, flat, umbrella-like clusters, appearing in July. The roots are spindle-shaped, and clustered just beneath the swollen base of stem. The roots are powerfully poisonous. The stems and seed are somewhat less poisonous, but yet dangerous. This is one of the most dangerous plants growing in the United States. It kills numbers of children and animals every year. The symptoms of cicuta poisoning are headache, muscular weakness, and paralysis of respiratory organs. Death is usually rapid. Remedies:—Emetics, then tannic acid, followed by a purgative; coffee, strychnine, whiskey, hot blankets.

General Treatment for Vegetable Poisoning.

In cases of human beings, the first and most important thing is to secure a speedy and complete evacuation of the stomach. An emetic must be used. The best emetic in this connection is sulphate of zinc—20 to 30 grains in a largs glassful of warm water. The next best emetic is mustard—a teaspoonful in a glass of warm water. If one or either of these does not act promptly, give the other, and repeat, if necessary, in five minutes.

After evacuating the stomach, give a half glassful of warm water, in which has been dissolved 5 to 10 grains of tannic acid. Let this act for ten or fifteen minutes, and then give a soothing demulcent to relieve the irritation of the stomach. Among common household commodities of this character the most useful are sweet milk, cream, liquid honey, castor oil, cod-liver oil, and sweet oil. If the pain is severe, from five to ten drops of laudanum should be added to the demulcent. After the demulcent has had time to act—from 30 to 40 minutes—stimulants may be given. The best household medicaments of this class are strong black coffee and whiskey. The latter should be given not more than a tablespoonful at a time in a half cup of warm water. Avoid cold drinks. If there are muscular spasms or delirium, bromide of potassium in lage doses should be given—two to four drachms in a small glass of warm water. Repeat at intervals of half hour if necessary.

For many violent poisons, the best antidotes are digitalis, atropine, morphine and strychnine. But all these are too dangerous for any one but a professional physician to administer. A solution of permanganate of potash —1 to 2 grains in a cupful of clean water, to which must be added a pinch of washing or cooking soda—has recently been tried with good results. The permanganate solution may be given in place of the tannic acid solution above recommended.

As a class, the toadstool poisons are more virulent than those of flowering plants. For toadstool poisoning, after the emetic, tannic acid or permanganate solution and the pain-killing demulcent have been given, a dose of atropine—1-120 to 1-60 grain—should be administered, preferably by hypodermic injection, but in the absence of hyperdermic syringe, this drug may be drank in a little water.

In many cases of plant poisoning, it is desirable to apply external heat to the body. The best way to do this is to make a hot-pack with blankets wrung out of water as hot as can be borne. The patient should lie down, with head level with feet, not raised by a pillow. In case of skin poisoning, such as is

caused by the poison-oak and poison-vine, an application of a warm solution of soda—either cooking or washing-soda—to the irritated skin should be the first remedy. After this, the injured parts may be bound with cloths wet with a saturated solution of sugar of lead on whiskey or alcohol.

In cases of animal poisoning, usually little can be done in the way of remedies. But lard or unsalted butter, or any bland oil, such as linseed oil, cotton-seed oil, sweet oil, or castor oil, in many cases relieves the pain and moderates the symptoms. This should be followed in an hour or two by a strong purgative, such as Epsom salts, of which 2 to 4 ounces may be given in a pint of hot water. This is best administered from a long-necked bottle. The animal should be covered with a hot blanket.

All of the cuts used in this paper, except Fig. 8, are reproduced from Bulletin No. 20, Division of Botany, U. S. Department of Agriculture. Fig. 2 is reproduced from Year Book, U. S. Department of Agriculture, for 1898.

A YARD OF BEANS.

I have received the pods of beans sent by Mr. Berrier. They are certainly of extraordinary length, and have little of the appearance of a cow-pea, but look like fairly good samples of the Dolichos Sesquipedalis, or "Yard-long Bean." I would be glad to have a few of these beans to test another season, so that I can better observe their character. It is certainly an interesting plant, and may be of value. The pods sent measured about two feet three inches.

TO CURE PEA-VINE HAY.

By the way, I am being continually asked to tell how to cure cow-pea hay. It may be a little late for printing directions, but I enclose what I have formerly published in my bulletin on Farming in North Carolina. I would add that the best time to cut the peas is when the pods begin to get yellow, but none are ripe, as the leaves soon begin to fall when the pods dry, and we want to preserve the leaves.

I have cut some quite green this summer, as they had gotten infested with hog weeds, and I wished to keep the seed of these from ripening. This green hay cured perfectly, and can be seen at any time in the barn at the Station farm. Cure the peas with as little exposure to the sun as possible, and never disturb them after they are in the barn, for if they are stirred after they begin to heat they will mould, but if let alone will cure finely.

CURING THE PEA FOR HAY AND STOCK FEEDING.

There has long been a notion that the cow-pea is a very hard crop to save in the form of hay. The many contrivances seen all over the country for the drying of pea vines attest the general prevalence of the idea. We have tried for some time past to tell how to cure the peas in a perfect and simple manner. But many have failed in the effort, while many others have succeeded in the making of the finest of hay. At the meeting of the North Carolina Horticultural Society at Southern Pines last summer, there was exhibited by one of the members a sample of pea-vine hay that was perfectly green in

color though completely dry, and had all the leaves retained, and these are the most valuable part, and the part commonly lost in the old methods of curing. Mr. J. Van Lindley, who made this exhibit, has the largest peach orchards in the State near Southern Pines. He has to keep a large force of mules for the cultivation of his orchards, and had been buying Northern hay for them, assuming that no feed could be grown in that sandy soil. Last year he tried the cow-pea, and cured them as I have often recommended by putting them when half dry into a barn and letting them cure in the mass. He also cured in the same manner a large crop of peas at his home-place in Guilford County. I happened there just as the first wagon load of the half-dry peas was brought to the barn, and found them doubtful in regard to storing them so green. I told them to go ahead and put them in, which was done, and a great supply of the finest hay was the result. Mr. Lindley says that he is now independent of the Northern hay, for he can make a ton to the acre on the barren sands at Southern Pines. The whole method is simply to cut the peas and when they are dried enough so that a bunch taken in the hands and twisted hard shows no sap running to the twist, they will do to go in. When once in the barn, they should not be disturbed while heating, but allowed to heat and cure with as little contact with the air as possible. I was in the habit of raking into winrows and cocks, but Mr. Lindley says that he finds that when they begin to heat in cocks before storing, they are more apt to mould, and he prefers to let them lie on the ground and get to the half-cured condition. The important thing is to store them while still limp, so that the leaves are saved, for these are the best part of the hay, and are commonly lost in the usual mode of drying completely outside. Care must be taken, however, that there is no dew or other external moisture on them when stored. The fact that nine-tenths of the farmers who have tried this method the past year have succeeded in making the finest of hay should encourage those who failed to try to find the reason for their failure till they too succeed, for if one man can make the best of hay by the barn cure, another should be able to do the same. The sample that Mr. Lindley exhibited was sent to the editor of the *Southern Planter*, at Richmond, Va. The editor, Mr. Jackson, is an experienced English farmer, and he said in his next issue that the sample came nearer to the finest English-cured hay of anything he had seen in this country. Having this valuable forage at hand, and the corn fodder to balance the ration, one should be able to feed stock in the best manner.

W. F. MASSEY.

"STAGGERS" AMONG HORSES IN THE NORTHEASTERN COUNTIES OF NORTH CAROLINA.

By Dr. TAIT BUTLER, Veterinarian.

There occurred, principally during the month of August, an outbreak of this disease among the horses in the northeastern counties of the State, particularly those counties bordering on Albemarle and Pamlico Sounds, which attracted considerable attention because of the extensive losses which resulted. Probably not less than five hundred horses died in the section indicated during the month of August and first half of September. The losses were more general and severe in Hyde County, but certain small areas in Camden, Beaufort, Dare and Pamlico counties suffered equally in proportion to horse population. That the disease existed in all the northeastern counties of the State, to a greater or less extent, is shown by the reports received from different sources.

The writer had not taken charge of the duties of the office of State Veterinarian when the disease was most prevalent and fatal, but during the latter part of August and first half of September he visited the counties of Dare, Camden, Beaufort, Hyde and Pamlico, observed several cases of the disease in its various stages, and made a *post-mortem* examination of a typical case. He also spent considerable time driving over these counties, examining the conditions under which the disease occurred, and talking with a large number of farmers, physicians and others who had lost horses from the disease, observed cases throughout their course, and made *post-mortem* examinations. From my own observations, as well as from the facts obtained from others, I have no hesitation in stating that this is no new disease. It is undoubtedly the same disease which has occurred in those sections at varying intervals during the last fifty years, and which is so thoroughly discussed by Dr. W. H. Harbaugh in the Third Annual Report of the Bureau of Animal Industry, 1886. It is similar to the disease which I have seen in Mississippi, Kansas, Iowa and Illinois, and which veterinarians have observed and described all over the civilized world since the earliest records of veterinary science. Harbaugh, in the report above referred to, quotes a very distinct and positive reference to it as early as 1750, while the veterinary literature of the last two decades is full of numerous accurate descriptions of its symptoms and the general conditions under which it occurs.

It has been, and is still, known by a large number of names, such as cerebro-spinal meningitis, enzootic cerebritis, staggers, mould poisoning, forage poisoning, etc. In the first and second of these names is noted an attempt to indicate the seat and nature of the disease; in the third a prominent symptom is accentuated; while in the fourth and fifth the supposed source of the cause of the disease is made prominent. Until more is known of the nature and specific cause of this malady—or perhaps more accurately speaking, this group of allied diseases—it matters little what name is applied to it. Therefore, since none of the names yet suggested seems to be

quite satisfactory, we shall, in this article, use the one by which it is best known in North Carolina—staggers.

A brief description of the causes, symptoms and treatment of the disease will not be out of place at this point.

Causes: My personal observation and experience in this and other States, extending over a period of seventeen years, corroborates the concensus of veterinary opinion, that this disease is the result of a poison (toxine) or poisons, produced by moulds, fungi or bacteria in and on decomposing vegetable matter, and which is introduced into the horse chiefly through the food supply, but possibly occasionally also through the drinking water when that drains from surfaces covered by large quantities of decomposing vegetable matter.

The evidence in support of this view, while most abundant and convincing, is largely what veterinarians call "clinical," or what the lawyers would term "circumstantial." However, there is some evidence of a more direct and positive character which gives conclusive proof that the suspected food was the cause of the disease in certain cases where it has been produced experimentally.

It is highly important that we come to a correct understanding of the causes of this trouble, for it is only through the removal of said cause that we can hope to control its ravages. Hence, we shall take the space necessary to give a few illustrations of the character of the evidence which has led veterinarians to an almost universal acceptance of the above theory of the cause of the disease. Out of the hundreds of similar cases which might be cited, only a few will be given.

Mr. H, living near Starksville, Miss., lost two horses from this disease. I suspected damaged, mouldy corn fodder as the cause. He did not believe the food had anything to do with the cause of the disease, so continued to use the condemned fodder. After losing a third horse, he acted on my advice and lost no more. All other conditions were left the same.

"Four horses, in a stable of six standing stalls, fed on home-raised oats kept in a granary in the barn, were affected within two days time. They were at once taken to a hay shed, one hundred and twenty yards distant, and there treated. Two died within two days from the time they were taken, the third lived about a week. The fourth recovered and was turned into a paddock, where he remained about a month; he was fed there when worked, and was watered at a stream that coursed through the field. His feed consisted of cut hay and ground wheat while at pasture. At the end of two months he was returned to his hay shed and fed again on the oats; on the fifth day he was found down and unable to rise—he died that day."

"About this time the owner bought three other horses and placed them in a wagon-house about two hundred yards distant from the hay-shed and one hundred yards distant from the barn. This shed was elevated, and the sanitary surroundings good. In fact, the place had been cleaned and whitewashed purposely for this test. These horses were given cut feed, etc., for two weeks, and then they were put on oats. They did well for a week and a half, when they began to grow dull and sluggish. The oat feed was continued as long as they could swallow with ease, or until they began to sali-

vate, when it was discontinued; the horses put in slings, fed on fresh western oats from the mill, and were given appropriate treatment. After about four weeks they entirely recovered."—*Dr. W. G. Benner, in Annual Report, Delaware Experiment Station, 1895.*

These are only two cases out of the very large amount of circumstantial evidence that might be cited if space would permit, but they serve to show its character. Of the direct evidence, which is very much less abundant, two cases will also be cited:

Mr. A, living near Wakefield, Kansas, lost four horses within one week that were being fed on corn of very bad quality, probably ten per cent being mouldy, rotten or worm-eaten. The other food seemed good, while the drinking water was of the best. The grain feed was changed from the suspected corn to sound oats and all other conditions allowed to remain the same. No further disease occurred. I had ten bushels of the worst of this corn selected and shipped about forty miles to the Kansas Agricultural College, where it was fed, under the best conditions, as related to other food and water, to two healthy colts purchased for the experiment. At the end of about three weeks, when the corn had been all consumed, one of the colts died, showing typical symptoms and *post-mortem* lesions of the disease.

Another striking case was reported by Dr. Pearson, of the University of Pennsylvania, substantially as follows: Several horses had died with a disease, which, from his description, was identical with that in this State, that had consumed quantities of damaged ensilage which was suspected of causing the trouble. The ensilage was withheld, and no further disease occurred. A quantity of this suspected ensilage was shipped to the hospital of the Veterinary Department of the University and fed to two healthy horses. Both developed typical cases of the disease and died.

To show how positive and general is the conviction among veterinarians that this class of disease is due to the causes above stated, a few quotations from prominent writers will not be amiss:

"I think the cause will be discovered in the nature of fungi, whose active principle is a subtle, delicate, narcotic poison, which is taken into the system with the feed and gains access to the circulation and is thereby conveyed to the great nerve centers and produces its toxic effects like other narcotic poisons with the accompanying train of symptoms."

"The evidence of fungi is too plain to be overlooked by any one who thoroughly investigates this matter and all the circumstances connected therewith."—*Dr. W. H. Harbaugh, Third Annual Report, Bureau of Animal Industry, 1886.*

It may be of interest to note that these were Dr. Harbaugh's conclusions after having investigated just such an outbreak of staggers in northeastern North Carolina as occurred there this year.

"We have in veterinary literature numerous records of disease in both horses and cattle in which the history plainly points to parasitic fungi (on plants) and moulds as the cause."—*Dr. R. R. Dinwiddie, Bulletin of the Arkansas Experiment Station.*

"I believe the cause is connected with the food, either developed in it through some fermentative process or upon it in the form of one of the many

parasitic fungi which grows on plants, grains and vegetation. That these, when they are consumed at certain stages of their development, make a poisonous impression upon the brain, and ultimately induce structural changes is shown, I think, by the history of the outbreaks wherever they can be traced." —*Dr. M. R. Trumbower, Special Report on Diseases of the Horse, Bureau of Animal Industry, 1890.*

"Musty or mouldy food of any kind is in general terms the popular verdict as the cause of meningitis. Oats poorly cured, corn, mow-burned hay, corn ensilage, corn fodder stacked or mowed away during a rainy fall, each and every one of these objects is *known* by some person as the positive, or at least the leading cause." "Practical and professional veterinarians write and teach that their experience inclines them to the belief that a fungus is the direct cause, and that it may grow on any one or all of the various things mentioned in the above paragraph."—*Annual Report, Delaware Experiment Station, 1893.*

It may be further stated that similar conditions are thought to be the cause of the disease by Professors Pearson, Law, Williams, Dieckerhoff, Friedberger and Frohner, and many other prominent veterinarians.

In reference to the outbreak of staggers which recently occurred in this State, it may be stated that the weather was hot and extremely wet just preceding and during the greatest prevalence and severity of the disease. The growth of vegetation had been very abundant, and this, with the wet and hot weather, was conducive to rapid decay, especially where the lands had overflowed. In short, just such conditions—decaying organic matter, heat and moisture—best calculated to favor the growth and development of moulds, fungi and bacteria.

In my examination of the foods used it was very difficult to find oats of this year's growth, whether threshed or unthreshed, that were free from must or mould. The corn fodder was almost equally bad. Shelled corn, corn meal, hominy, grits, etc., were also in a more or less damaged condition. In fact, the weather being hot and the atmosphere full of moisture, even where forage was put up in fairly good condition, it afterward became mouldy. In nearly every instance, even when the owners thought and affirmed that the forage was all right, an examination showed it to be in anything but good condition. In many cases the water was of the worst possible character. The wells receive the surface drainage from lands covered with large quantities of decomposing vegetable matter, the result of the atmospheric conditions above mentioned.

It may also be stated that horses kept in the stable, fed good hay and corn or oats, and given pure water, remained healthy. This was invariably the case where horses were fed sound corn and hay of last year's growth.

Symptoms.—The first symptom noticed is usually a dull, sluggish condition. When standing, the head is generally lowered and not infrequently rests on the manger or against the wall. The animal will usually eat, but frequently has some difficulty in swallowing, which is more apparent when drinking. When walking he may show an inability to properly control his hind parts, which gives a staggering gait. When standing, he may lean against the stall or other available object, or when walking show a tendency to swerve to one side, which is sometimes so pronounced that it causes him to walk in a circle. In some cases he becomes blind, but while usually able to see, he does not

appear to be able or care to control himself, and walks over or against anything that happens to be in his course. In many cases there is a tendency to periods of excitement, but in the recent outbreak this was very frequently absent. In severe cases the patient may fall to the ground within from twelve to twenty-four hours after the first symptoms are noticed. In fact, in the virulent form of the disease in which it appeared this year, death frequently results within that time. In most cases, however, the animal stands for a long period, or may live for two or three days after going down. On the other hand, they occasionally stand until shortly before death. They are then said to "die on their feet." While on the ground they generally remain quiet, in an unconscious or semi-comatose condition, with only occasional short periods of struggling, during which they bruise themselves badly about the head and other prominent parts of the body. The temperature, pulse and rate of breathing are variable, depending on the stage of the disease, general condition of the animal, and the several secondary complications which frequently occur. In cases where great dullness is exhibited, with little tendency to periods of excitement, and where the disease is confined to the brain, the pulse and temperature may be found normal, or sub-normal. When the trouble seems to be more of a spinal nature, or when lung, heart or digestive complications arise, the pulse, temperature and breathing will be more markedly affected. In the above brief description no attempt has been made to state all the symptoms that may be presented, nor will any one horse necessarily show all we have named. We have merely aimed at describing the actions of a diseased animal as he will usually appear to the average stock-owner. It will also be noted that nothing has been said of the diseased conditions of the heart, lungs, liver, kidneys and digestive organs, which may sometimes exist. These will be considered in connection with another matter, being purposely omitted at this time because I do not consider any one of them either essential to or generally a complication of the disease.

Post-mortem Appearances.—Lungs: Physicians and farmers who had made *post-mortem* examinations usually reported the lungs badly diseased, but no intelligent distinction could be obtained, even from physicians, between merely a badly congested lung and one solidfied (hepatized) by infiltration of inflammatory products. I am, therefore, compelled to base my opinion of what existed in this outbreak on the examinations made by myself, and those held by myself and others in similar outbreaks in other sections. To the veterinarian it is a well-known fact that the lower lung is likely to be congested, may even be black, no matter from what disease the horse may have died. It is merely a gravitation of the blood to the lower side, a hypostatic congestion, as it is called. In this outbreak, only one lung was usually reported diseased, and where the person remembered it was without exception the lower lung. I am, therefore, led to believe that a large share of the reported lung disease was of this spurious character. In the lungs examined by me there was certainly no evidence of disease, and this coincides with my experience elsewhere, as well as with the reports of other veterinarians. However, there is quite a general impression that this is a lung disease, and before dismissing the subject, it may be well to briefly consider what effect the primary disease of the brain may have on the condition of the lungs. On this point Harbaugh says: "We can not wonder at this state of the lungs.

when, from the symptoms furnished, in many cases we must conclude that death took place from paralysis of the muscles of respiration, and in all the cases the brain being affected, other functions than respiration were more or less affected; for instance, suspended digestion, torpidity of the bowels, retention of the urine, loss of vision, loss of muscular control, etc. Our knowledge of pathological anatomy teaches us to expect to find the lungs congested when an animal dies in a comatose state; from *post-mortem* examinations we know there is always congestion of the lungs when death is caused by cerebro-spinal meningitis; and in cases of fatal poisoning by narcotics, we know that a congested state of the lungs is discovered *post-mortem*. It is a natural consequence of failure of the heart's action, or paralysis of the muscles of respiration, and, therefore, we expect to find the lungs in a congested state."

Another fact which may account for some of the reported disease of the lungs in these cases is that, the power of swallowing being impaired, when the animal is forced to take medicine, as he often is, even through his nose, some of it passes in the lungs and more or less well-marked pneumonia is produced by the irritant. In dismissing this phase of the subject, it is quite safe to state that the disease is primarily and essentially one of the nerve centers, brain and spinal cord, and that such real disease of the lungs as may be found is a secondary complication.

Heart: In the report of *post-mortem* examinations, made on cases of this disease by veterinarians in other parts of the country, yellow (*ante-mortem*) clots are mentioned as frequently found in the heart and large blood vessels. The same was observed in the recent outbreak, especially in Hyde County. The sack surrounding the heart (pericardium), and even the loose tissue adjacent, are apt to contain an unusual amount of a bright yellow liquid.

The liver and kidneys are also at times more or less congested, but this is by no means always the case.

The digestive organs are either full or empty, according as the horse has fasted or continued to eat, but seldom show any sign of disease other than the general congestion affecting all the internal organs. The distention of the intestines with gas (bloating), which is frequently noticed, is the result of the general disturbance of the body functions, due to the condition of the brain, which largely controls these functions.

Brain: An examination of the brain is generally unsatisfactory to one not familiar with its delicate structure, and the nature of the disease affecting it. This delicacy of structure and its importance to the functions of the organs of the body which it controls render even slight changes, which would not be noticed by the average farmer, quite sufficient to account for the most prominent symptoms, and even for death itself. The result is that those who make *post-mortem* examinations frequently report that "the brain was all right or only slightly congested." That which appeared as only a slight congestion may have been ample to account for the death of the animal. There is usually, but perhaps not always, a marked congestion of the vessels of the coverings of the brain, which is especially noticeable in the pia or inner covering. The blood vessels of the lateral cavities (ventricles), and the vessels beneath the small hind brain (cerebellum), are also usually congested. An effusion of liquid into the cavities, rupture of small blood vessels, blood clots, and even the breaking down of the brain tissue are frequently observed, but

the last, while common in some forms of the disease, is rare in the type of the disease occurring in this State. The conditions mentioned are ample to explain the various symptoms of the disease, but any or all of them might be overlooked by the careless or unskilled examiner. In speaking of this matter in his report of his investigations in North Carolina and Virginia, Dr. Harbaugh says: "Nor can we express surprise because they failed to discover lesions in connection with the brain when we are aware that the most expect pathologists often fail to discover very evident lesions in this class of diseases, especially when death follows poisoning by narcotics."

Treatment.—There are two very good reasons why little good is likely to result from any treatment that may be suggested for this disease. The first is, the exact nature of the poison (cause) being unknown, we are unable to select a proper antidote. The second is the short duration of the disease after the first symptoms are noticed. All that can be done is to prescribe such general treatment as will best tend to maintain in active condition the organs which excrete the waste matters of the body, and then treat the various complications as they may arise. During the first stages a purgative consisting of from six to eight drams of aloes and one dram of calomel may be given. Cold applications to the head, with warmth to the body may also be of service. Bromide of potash in from four to six dram doses, and one dram doses of fluid extract of belladonna, have also been recommended in the first stages. Quinine and iodide of potash in one dram doses have each been prescribed with a view of antagonizing the poison or eliminating it; but the greatest care should be exercised in attempting to pour medicine down a horse in this condition, for his difficulty in swallowing renders him especially liable to strangle, when the medicines may enter the wind-pipe and lungs. Blood letting, aconite, blisters and the like may be of service at certain stages of the disease, but they are too liable to abuse in their application to justify their recommendation for general use.

Prevention.—It is quite safe to say that general and promiscuous bleeding, or the administration of medicines several days or weeks prior to the attack, while the disease is in the vicinity, is worse than useless. Any person at all familiar with the principles of medical science will readily recognize that fact, and it may be further stated that a horse in good health is in the best possible condition to resist disease, and that no amount of bleeding, purging or other medication of any sort will increase his vigor or better enable him to withstand disease. Moreover, good, sound food, regular exercise, and pure air and water are the best tonics and health preservers that any man can give his stock. The disease is rare in dry seasons. It is never seen in well-drained sections where the sanitary condition of the stables is good, and the horses receive good, sound food, free from must or mould, and are given pure water to drink. These conditions are extremely difficult to obtain in certain eastern sections of this State, during a season like the months of July and August of this year, but by the nearest possible approach to them the ravages of the disease will be reduced to a minimum. It is not sufficient that the feed and water be as good, or better, than that which other horses which remain well are receiving, but to insure safety from an attack of the disease, the food and water must be of the best, and preferably that grown the previous

season. Horses kept in good stables, that receive pure water, and are fed on sound ear-corn and hay of the previous season's growth, are almost certain to remain free from the disease. If sound, sweet hay grown the previous year can not be obtained, then green fodder may be used if fed as soon as cut.

As numerous theories concerning the nature and causation of the disease were advanced by the stock-owners of the affected district, it may not be out of place to briefly examine some of them. As might have been expected, it was first thought by many to be contagious, but instead of starting at any particular point and radiating therefrom, as a contagious disease would, it developed simultaneously over a large section of country. Moreover, in most instances only one or two cases occurred on a farm or in a stable, while the other horses running or stabled with them remained healthy. In short, it showed none of the distinguishing features of a contagious or infectious disease.

The opinion frequently advanced that the poison was in the air has just as little foundation in fact. To-day we know that the causes of such diseases are either chemical poisons (toxines) or living germs, the former of which are not carried in the air and the latter, if at all, only comparatively short distances. This is an easy way to account for any disease; but it is not usually borne out by the facts. Too many farms and small areas within the affected districts remained entirely free from the disease while it existed on all sides, to permit of the idea that the cause was carried in the air. Not a few believe that the disease is of a malarial nature. Before the true nature of malaria was known, the prevalence of the two diseases in low, poorly-drained sections lent some color to this assumption, but since we know that the characteristic changes which take place in the blood of malarial patients is absent in staggers, this alone is sufficient to indicate that the diseases are due to different causative agents. Moreover, the symptoms of staggers are in no sense like those of malaria in man. In fact, the diseases in their general course and termination are entirely and distinctly different. Again, malaria was not common in the human family in those sections where staggers was the worst.

Those who thought the disease due to the dews and night air, and pastured their horses only in the day time lost horses equally with those who thought it was due to the hot sun and vapors arising from the damp earth during the middle of the day, and pastured only at night. In short, horses stabled and not pastured at all, died as often as those allowed to run out.

For many years there has existed in this section of the State a growing belief that mosquitoes were either the cause of the disease, or a means of carrying it from one animal to another. The fact that the mosquito is now known to transmit malaria and yellow fever, has strengthened this belief in the minds of a few. We know of no scientific evidence which justifies the statement that the mosquito is concerned in the causation of staggers, nor does the circumstantial evidence seem to bear out the theory. The mosquito and staggers do not always go together. They correspond neither in the time of their prevalence nor the sections affected. Staggers occur at seasons of the year when no mosquitoes are present, and I have seen it in sections where mosquitoes were never numerous. That staggers frequently occurs during seasons when mosquitoes are numerous, can not be denied, but it must be remembered that the atmospheric conditions favorable for the production of mosquitoes are also favorable for the development of those food conditions

which veterinarians have learned by experience to regard as the cause of staggers.

As is so frequently the case when the cause of a disease is not well understood, staggers has been attributed to the action of certain plants possessing real or imaginary poisonous properties. It may be put down as a very safe conclusion that the poisoning of horses by green plants eaten in the pasture is extremely rare. Few plants contain sufficiently active poisons in their green state to make it likely that a horse would eat enough of them to produce death. Besides, in seasons when grass is abundant horses are not so likely to eat poisonous plants. In the spring of the year when grass is scarce and the poisonous plants are young is when such cases of poisoning are most common. In short, those cases where horses died that were kept in the stables and fed on Northern hay and threshed oats, would seem to acquit those Southern plants sometimes accused of causing the trouble. The supposed connection of Helenium Autumnale and Helenium Tenuifolium with the causation of staggers well illustrates the case in point. The former is the common sneezeweed of the Southern States, is not especially abundant in the sections visited, and at the worst is only feebly poisonous. The latter is the common so-called bitter-weed of the central Southern States, and is not at all poisonous to live stock, even when eaten in large quantities, as I can testify from personal experience.

There is, perhaps, one other point which merits notice. A very small minority of those who have lost horses by the disease during this outbreak, and who had lost horses from staggers in previous years, believe that the disease prevalent this year is entirely different from that from which they had suffered in the past. I have not the space in which to make an extensive comparison of the symptoms as recorded by competent men in other years, with those I observed in this outbreak, but to those who are interested in this matter, I refer them to the excellent report of his investigations in North Carolina and Virginia, made by Dr. W. H. Harbaugh, in the Third Annual Report of the Bureau of Animal Industry, Washington, D. C., 1886.

It may be further stated that the disease is, in all essential features, the same as has previously occurred in these sections, but owing to the aggravated conditions favoring the development of the disease, which existed this year, it appeared in a more severe and rapidly fatal type than usual. No two cases of any disease will present the same symptoms, nor are two outbreaks of a disease ever exactly alike, but if the essential symptoms, *post-mortem* lesions, and history of the diseases are the same, it is sufficient to establish their identity. In this case we think the greater prevalence and rapidly fatal type of the disease sufficient to account for all the trivial and seeming differences recorded.

THE VALUE OF COTTON SEED AND MEAL FOR FEED AND FERTILIZER.

BY B. W. KILGORE.

The shortage of the cotton crop and the great demand for seed and its products for fertilizer, feed and oil, are attracting unusual attention just now to cotton seed. Cotton as picked, yields slightly less than one-third lint, and somewhat more than two-thirds seed. Does the farmer get for this latter two-thirds of the cotton crop (the seed) what he should when he sells them, or does he get "out of them" what he should when they are used at home for feed or fertilizer? Let us look at this in the light of the accumulated results and experience from the use of cotton seed and its products.

When subjected to the treatment of the oil mills, one ton of seed yields about the following amounts of products:

One ton (2,000 pounds of seed) gives—

Hulls	850 lbs.
Linters (short lint)	25 lbs.
Meal	725 lbs.
Oil—37 gallons	275 lbs.
Loss (dust, water, etc.)	125 lbs.
	2,000 lbs.

Different seed the same season, as well as in different seasons, yield varying quantities of products. The better mills from good seed get 40 gallons, instead of 37 as shown above, of oil, in which case the quantity of meal would be about 700 instead of 725 pounds. In like manner, good, clean, dry seed would yield more than 850 pounds of hulls and there would be less loss in the way of sand, dust, water, etc.

COTTON-SEED MEAL AND HULLS FOR FEED.

Hulls.—The hulls from the seed were formerly much used for fuel for running the engines at the oil mills, and may occasionally be used for that purpose yet; but the main demand for them is for feeding beef cattle, cows and sheep, a demand to which the supply is not equal. It is becoming the rule for cattle to be fattened for beef at or near the mills in the South during the winter on hulls and meal. We can make no close estimate of the number thus fed, but they certainly run into the hundreds of thousands. Hulls and meal are among the main feeds for fattening cattle in this section, and they are important factors in the feeding of milch cows and sheep.

The value of a feed depends on its composition, digestibility and palatability. The palatability of hulls is shown by the fact that animals eat them readily and with relish. The chemical analysis of hulls, and their actual digestibility (solubility in the animal juices), as determined by a number of experiments with cattle and sheep, show them to be worth from one-half to

two-thirds as much as the ordinary grass hays. In composition they are similar to the grass hays, but only one-half to two-thirds as much of them are actually used by the animal as of the hays. They make a very coarse, bulky feed; but a certain amount of bulk is necessary in feeding cattle and sheep, and hulls are extremely handy and convenient for diluting cotton-seed meal, which is too rich and concentrated for feeding alone. Practically the entire output of hulls from the mills sells readily at the mills from $4.00 to $6.00 per ton, and sometimes even higher, for feeding. The price at the oil mill in Raleigh last season was $5.00 per ton for loose hulls and $6.00 for baled hulls. The price paid for hulls should be governed by the cost of good hays, the facts already stated being taken as basis for comparing the value of the two feeds. When good grass hays, like Bermuda, crab-grass, timothy, etc., costs $10.00 per ton, then cotton-seed hulls are reasonable at $4.00 or $5.00 per ton for feeding to cattle. It is to be borne in mind that cow-pea vine hay is considerably more valuable than the grass hays alluded to above, and the hulls are not worth proportionately so large an amount of it as of the other hays.

Meal.—Usually more than half of the total output of cotton-seed meal from the oil mills of the South is annually exported to foreign countries and there used for feed for cattle and sheep. This shows the high esteem in which meal is held abroad, as the cost, by the time it reaches the feeder, must be from $30.00 to $35.00 per ton. A considerable portion of what remains in this country goes to the dairy and feeding sections of the East, Northeast and Northwest, where it costs the feeder from $27.00 to $32.00 per ton, when it costs $25.00 at home; the balance is used at home for feed and fertilizer.

The greatest use and value of the meal is as a feed. It is acknowledged everywhere to have few equals and no superior as a concentrated feed for beef cattle and dairy cows. Numerous feeding experiments have shown it to produce pound for pound more milk and butter when fed to milch cows, and more growth and gain in fattening animals, than corn or corn meal, and generally more than wheat bran, linseed meal, and the other common concentrated feeds. It stands at the head of concentrated feeds, and I say this after a number of years' investigation of the subject and an extensive study of experiments in comparison with other feeds.

We may quote here profitably some of the experiments bearing on this point. "In four years' experiments at the Pennsylvania Station, mixtures of corn meal and cotton-seed meal with coarse foods, produced better and cheaper gains than corn meal alone with the same coarse foods, cotton-seed meal replacing more than its own weight of corn meal in the rations and reducing the amount of food required to produce a pound of gain." At the Texas Station, "in three years' experiments in fattening 160 Texas steers and eight cows on cotton-seed products in different rations, in comparison with each other and with corn, obtained results *in all cases* indicating the superior feeding qualities of cotton-seed products over corn." Carefully conducted experiments at the Mississippi Experiment Station gave similar results to those obtained in Texas and Pennsylvania. Nine of these experiments, covering four winters' feeding at the Pennsylvania Station and two at the Mississippi Station, furnish valuable information as to the comparative feeding value pound for pound of cotton-seed meal and corn. They show that one pound of cotton-seed meal produced in the same rations as much beef as 1.34 pounds to

2 pounds of corn meal, the average being 1 pound cotton-seed meal to 1.73 pounds corn meal. This means (as an average of results) that 1 ton of cotton-seed meal is worth as much for feeding for beef as 1.73 tons of corn meal or corn, but where corn is worth 40 cents per bushel ($14.20 per ton) cotton-seed meal is worth $24.60 per ton, and when corn is worth 80 cents per bushel, meal is worth double the above figures. These figures, especially at the present time of high-priced corn and other food products, are full of significance for Southern farmers and stock-growers; and they are founded on actual feeding tests with animals, and are not based on theoretical considerations, and should be better understood than they are in the home of the cotton seed.

But it should be remembered that cotton-seed meal is a very rich concentrated feed, which can not be fed alone and must be fed with care and judgment in all cases. With coarse, bulky feeds like cotton-seed hulls, the grass hays, and the corn plant, whether shredded or cut, meal makes most excellent rations. For fattening steers, three to four pounds of meal per day are given at first, and all the hulls, hay, or corn fodder, that the animal will eat without waste. The quantity of meal is increased gradually to six, eight and ten pounds per animal per day, with hulls, hay, or corn fodder, or all, as before. The best proportion of meal and hulls, as indicated by a great many experiments, are one pound of meal to three to four pounds of hulls after the feeding is well in progress and the animals have become accustomed to the diet.

THE COMPARATIVE VALUE OF COTTON SEED AND CORN.

The cotton seed is not understood in its home in the South as it should be, neither is its feeding value fully appreciated. We do not know how to feed cotton seed as well as we do its products—meal and hulls—and I do not consider that we know the feeding value of the seed as well as we do that of hulls and meal. Cotton seed are not so readily eaten as its products are, especially meal. Nevertheless, we know them to be a valuable feed, and there is quite a considerable array of data obtained from experiments that show that pound for pound cotton seed is fully equal in feeding value to corn. At the Texas Station cotton seed in rations produced cheaper and more rapid gains for short periods (about thirty days) than corn or cotton-seed meal, but the seed loaded the animals with fat so quickly that the rate of laying on flesh was greatly decreased in long periods. Raw and boiled seed at $7.00 per ton made much cheaper, but smaller, gains than cotton-seed meal at $20.00 per ton, and the rations with corn were the dearest ones fed. From two of these experiments we find that one pound of cotton-seed meal equals in feeding value, beef producing value, 1.21 pounds of corn; and at the Mississippi Station one pound of cotton seed was found to be equal to 1.06 pounds of corn and cob meal. Averaging this and the Texas results, we get 1 pound of cotton seed, equal to 1 to 1.13 pounds of corn meal. This means that 1 ton of cotton seed is worth as much for producing growth in beef animals as 1.13 tons of corn or corn meal, and that when corn is worth forty cents per bushel ($14.20 per ton), cotton seed are worth $16.00 per ton, or 24.2 cents per bushel of thirty pounds. And with corn at 80 cents per bushel, cotton seed are worth as feed $32.00 per ton, or 48.4 cents per bushel.

COMPARATIVE FEEDING VALUE OF COTTON-SEED MEAL AND SEED.

A great many experiments have shown cotton-seed meal to produce pound for pound more beef than cotton seed, but only a limited number of these experiments are of such a kind as to enable us to arrive at anything like a definite idea of the relative beef producing powers of the two. Two experiments at the Texas Station, already referred to, and one at the Mississippi Station, show 1 pound of cotton-seed meal to have produced as much beef as 1.54, 1.35 and 1.50 pounds of cotton seed respectively. As an average of the three experiments, 1 pound of cotton-seed meal produced as much beef as 1.47 pounds cotton seed. Taking this comparative feeding value as the basis, 1 ton of cotton-seed meal will produce as much beef as 1.47 ton cotton seed, and when cotton-seed meal is worth $25.00 per ton, cotton seed are worth for producing beef $16.66 per ton, or 25 cents per bushel.

It is not to be assumed that results exactly the same as those given on the preceding pages for the comparative feeding values of corn, cotton seed and cotton-seed meal will be obtained in all feeding trials. The figures given represent averages, and results reasonably close to them may be expected in good feeding. Attention must, of course, be given to combining the feeds properly so as to get the most out of them all.

It is also to be borne in mind that the feeding value of any product is comparative, and that the price will rise and fall with the change in market price of the standard feed of the section used for comparison with the price of the products—beef or milk and butter—into which it is converted. Corn has been used as the standard feed with which to convey an idea of the feeding values of cotton seed and cotton-seed meal, because the feeding value of corn is so well understood in a practical way and appreciated by farmers. It does not necessarily follow that feeding beef animals on corn at 40 or 80 cents per bushel would result in a profit to the feeder, but that when corn can be thus fed cotton seed and meal are profitable at the prices assigned to them for the same purpose.

COTTON-SEED PRODUCTS FOR MILK.

Cotton seed and its products are valuable milk and butter producers. They do not injure the milk for drinking purposes, but when fed in too large quantity, they do affect the quality of the butter produced, giving it a higher melting point, and making it firm, which is an advantage in a warm climate, but at the same time the texture is injured, the butter being sticky and the flavor poor. When, however, seed and meal are properly combined with grain and hay feed, so that the cotton-seed products do not form over one-fourth of the grain ration, this injurious effect on the quality of the butter is not apparent. Two to three pounds of cotton seed or meal may be fed per cow per day without materially affecting the butter. Cotton-seed meal is rich in flesh formers and milk producers, and its value as a dairy food is unquestioned and undoubted. For mixing with cotton-seed hulls, corn-fodder, ensilage, and the grass hays—feeds of the opposite kind from cotton-seed meal—it has no superior. Numerous experiments have shown cotton-seed meal, in the same rations, to produce, pound for pound, more milk and butter than corn meal, wheat bran, or the other grains and concentrated feeds in common use.

The Mississippi Station worked for two winters on the relative milk and

butter producing powers of cotton seed, cotton-seed meal and corn. The results of these experiments indicate that these feeds have about the same relative milk and butter producing values as have already been stated for them for beef production.

VALUE OF SEED AND MEAL FOR FEED.

It will be well to bring together here concisely the results of the foregoing discussion:

One pound of cotton seed equals 1.13 pounds of corn or corn meal.

One pound of cotton-seed meal equals 1.75 pounds of corn or corn meal.

One pound of meal equals 1.5 pounds of seed.

From these figures, obtained in actual feeding tests, it will be seen that:

1. When corn is worth 80 cents per bushel, or $1.42 per 100 pounds, or $28.40 per ton, cotton seed should be worth $1.60 per 100 pounds, or 48.4 cents per bushel, or $32.00 per ton.

2. When corn is worth 40 cents per bushel, cotton seed are worth 24.2 cents per bushel as feed, or $16.00 per ton.

3. When cotton seed are worth 25 cents per bushel, or $16.66 per ton, corn should be worth only 37.5 cents per bushel.

4. When cotton-seed meal is worth $25.00 per ton, or $1.25 per 100 pounds of cotton seed should be worth 84 cents per 100 pounds, or 25 cents per bushel, or $16.66 per ton.

5. When seed are worth 20 cents per bushel, or $13.32 per ton, meal should be worth $20.00 per ton.

COTTON-SEED MEAL FOR HORSES AND MULES.

I do not know of any cases where cotton seed have been fed to this class of stock. Cotton-seed meal has been fed to a limited extent, but there is not a great deal of definite information at hand regarding the results of the feeding. I know of five reports of cotton-seed meal having been fed in connection with grain feeds and hays with good results, usually at the rate of about 2 pounds per day.

COTTON SEED AND PRODUCTS FOR HOGS AND CALVES.

Nearly all of the carefully-conducted experiments show that neither cotton seed nor meal can be fed profitably to hogs and young calves. Not only can they not be fed profitably, but generally they are positively injurious and most frequently result in the death of the animal when persisted in. Whether death in these classes of animals is due to such mechanical causes as loose lint, large amount of oil, hard and sharp seed coats, or whether cotton-seed products contain originally a toxic principle, or whether such is developed as the result of decomposition outside of or change within the animal body, is yet an open question, and is a nice and important one, to be solved in connection with the problem of feeding cotton-seed products.

RATIONS FOR MILK AND BEEF.

To make the foregoing portion of this article on feeding thoroughly practical, some rations, which give good results in feeding these materials, are added.

For beef:

1. 1 lb. cotton-seed meal to 4 lbs. cotton-seed hulls. Feeding all the animals will eat readily.

(Corn fodder [the whole corn plant], or the grass hays, may replace a portion of the hulls in this ration.)

2. 1 lb. cotton-seed meal to 5 lbs. corn fodder (whole corn plant). Feeding all the animals will eat.

3. 1 lb. cotton-seed meal to 6 lbs. grass hays. Feeding all the animals will eat.

4. 5 lbs. cotton seed.
 5 lbs. grass hay or corn fodder.
 13 lbs. cowpea-vine hay.
 ———
 23 lbs.

While these rations are specially for beef production, they are suited also for milk when it is not intended to make butter from the milk.

RATIONS FOR MILK AND BUTTER.

5. 2 lbs cotton-seed meal.
 3 lbs. corn meal.
 3 lbs. wheat bran.
 15 lbs. grass hay, corn fodder, or stover.
 ———
 23 lbs.

6. 2 lbs. cotton-seed meal.
 6 lbs. corn meal.
 8 lbs. grass hays, corn fodder, or stover.
 8 lbs. cowpea-vine hay.
 ———
 24 lbs.

7. 2 lbs. cotton seed.
 2 lbs. corn meal.
 4 lbs. wheat bran.
 8 lbs. grass hays, corn fodder, or stover.
 8 lbs. cowpea-vine hay.

(Pasturage may take the place of the hays or coarse feeds in these rations, and cotton seed especially are fed to best advantage in combination with pasturage or an abundance of coarse feeds.)

These latter rations (5, 6, 7) will suit as well for beef, but are more expensive than the first ones. They will produce a good quality of butter. Their nutritive ratios (comparative amounts of muscle making and heat and force producing constituents) vary from 1:5.4 to 1:6.1. The grass hays and corn fodder may be replaced by ensilage or green forage by allowing about 3½ pounds ensilage or forage for 1 pound of the other feeds.

Animals weighing about 1,000 pounds eat 20 to 25 pounds of dry feed per day. Larger ones eat more, smaller ones less. It is to be borne in mind that a certain amount of feed is necessary to run the animal machine. All beyond this goes to the production of milk and butter and beef. Liberal feed-

ing, then—close to the limit of the animal's appetite without gorging and getting it off its feed—is the most economical feeding.

COTTON SEED AND MEAL AS FERTILIZERS.

Meal is much used as a source of ammonia in commercial fertilizers in the cotton States, and the seed are used directly by farmers for fertilizer in no small quantity. A ton each of cotton seed and meal contain ammonia, phosphoric acid, and potash (on basis of values given to these constituents in raw or unmixed fertilizer materials in this State) to the value of:

One ton (2,000 lbs.) cotton seed contains—	
Ammonia 75 lbs. at 14 cents	$10.50
Phosphoric acid 26 lbs. at 4 cents	1.04
Potash 24 lbs. at 5 cents	1.20
Fertilizing value of a ton of cotton seed	$12.74
One ton (2,000 lbs.) cotton-seed meal contains—	
Ammonia 170 lbs. at 14 cents	$23.80
Phosphoric acid 56 lbs. at 4 cents	2.24
Potash 36 lbs. at 5 cents	1.80
Fertilizing value one ton cotton-seed meal	$27.84

It takes 2.6 tons of seed to make a ton of meal.

The above figures expressing the fertilizer value of cotton seed and meal are on basis of prices quoted the past spring for raw or unmixed fertilizer materials in retail lots for five tons or less, for cash, at the factory. According to these valuations, when kainit delivered on the farm costs $12.50 per ton, 13 per cent acid phosphate $11.20, nitrate of soda $50.00 per ton, and dried blood $45.00 per ton, cotton seed are worth as a fertilizer $12.74, or slightly more than 19 cents per bushel of thirty pounds.

VALUE OF COTTON SEED ON THE FARM.

The foregoing figures were stated to be on basis of prices of fertilizer materials at the factory. The farmer would have to pay freight, merchants' commission, and cost of hauling to the farm, if he sold his seed and bought an equivalent amount of fertilizer materials to replace them. The price of seed should, therefore, be increased to meet this additional cost, and would be something like the following:

When 13 per cent acid phosphate delivered on the farm costs $14.00 per ton, kainit with 12.50 per cent potash costs $14.00 per ton, and nitrate of soda $60.00, dried blood of 16 per cent $50.00, and fish-scrap $32.00, then cotton seed are worth on the farm $14.64, as follows:

One ton seed contains—	
Ammonia 75 lbs. at 16 cents	$12.00
Phosphoric acid 26 lbs. at 5.4 cents	1.30
Potash 24 lbs. at 5.6 cents	1.34
Fertilizing value of one ton seed	$14.64

This is equal to 22 cents per bushel of 30 pounds.

Or, in case it is desired to buy acid phosphate and kainit or some other potash salt to use with the cotton seed to make a complete fertilizer for cotton, corn or other crops, the seed will have a still higher value, as the same amounts of ammonia, phosphoric acid and potash always cost more in a mixed fertilizer than in the unmixed materials. Looking at the value of seed as fertilizer from this standpoint, when a mixed fertilizer, containing 8 per cent available phosphoric acid, 2 of potash, and 2 of ammonia, costs delivered on the farm $18.00 per ton, cotton seed are worth $16.34 per ton, as follows:

One ton seed contains—	
Ammonia 75 lbs. at 18 cents	$13.50
Phosphoric acid 26 lbs. at 5.2 cents	1.35
Potash 24 lbs. at 6.2 cents	1.49
Fertilizing value of one ton seed	$16.34

This is equal to 24.5 cents per bushel.

Should the 8-2-2 fertilizer cost $20.00 per ton, then the seed would be worth $17.16 per ton, as follows:

One ton seed contains—	
Ammonia 75 lbs. at 20 cents	$15.00
Phosphoric acid 26 lbs. at 5.8 cents	1.51
Potash 24 lbs. at 6.9 cents	1.65
Fertilizing value of one ton seed	$17.16

This is equal to 25.8 cents per bushel.

The value of cotton seed as fertilizer has been presented along with the cost of ordinary fertilizer materials and a complete fertilizer because the seed, if sold from the farm, would have to be replaced, to a considerable extent at least, by these materials for the farmer to use in mixing, or else by a complete fertilizer. This is, perhaps, the best way to convey an idea of what it will require to replace the seed, if disposed of, and every farmer should calculate what it will cost to bring back to the farm fertilizer material of equal value to the seed before deciding on the price at which to sell them.

WHAT DOES THE OIL MILL GET OUT OF THE SEED?

At present prices the oil mills are getting for the products from a ton of seed:

725 lbs. meal at $25.00 per ton	$9.06
275 lbs., 37 gallons, oil at 33 cents	12.21
850 lbs. hulls at $5.00 per ton	2.13
25 lbs. linters at 3 cents	.75
125 lbs. loss	
2,000 lbs., total value	$24.15

These products cost the oil mills:

First cost of seed at 25 cents per bushel	$16.66
Cost of working, bags, fuel, etc	3.50
Total	$20.16

This leaves a net profit of $3.99 per ton of seed. Of course, where freight is paid in addition to above cost of seed it must be deducted from profit.

On basis of the foregoing we are justified in drawing the following

CONCLUSIONS:

(1) That cotton seed are worth as fertilizer on the farm between $14.00 and $17.00 per ton, depending on the prices paid for acid phosphate, kainit, nitrate of soda, dried blood, etc., and whether they are bought already mixed in a complete fertilizer or before mixing.

(2) That with cotton-seed products—oil, meal, hulls and lint—at present prices there is a good profit for the oil mill with seed at 25 cents per bushel, and if the products rise, the price of seed should increase.

(3) That 1 pound of cotton seed equals in feeding value 1.13 pounds of corn or corn meal, and when corn is worth 80 cents per bushel of 56 pounds, cotton seed are worth 48.4 cents per bushel of 30 pounds. With corn at 40 cents, cotton seed are worth 24.2 cents per bushel, or $16.00 per ton.

(4) That 1 pound of cotton-seed meal equals in feeding value 1 3-4 pounds corn or corn meal.

(5) That 1 pound of cotton-seed meal equals in feeding value 1 1-2 pounds of cotton seed, and when seed are worth 25 cents per bushel, or $16.66 per ton, meal is worth $25.00 per ton; and with seed at 20 cents per bushel ($13.32 per ton), meal is worth $20.00 per ton.

SPARE THE BIRDS.

Nature and man have different methods of forest planting. Nature is deliberate, man always in haste. Nature begins with the seed, man demands a tree already grown to start with, the larger the tree the better. Nature designs variety, all sorts of trees mingled together, some of economic worth, many being valueless for commercial uses.

We view a forest: A hurricane sweeps through the wood leveling the timber by a single blast; miles of territory are cleared of all forest growths.

Time passes: The dead trunks feed the fire which completes this work of destruction.

Nature abhors a barren waste and in time begins the work of restoration. Birds fly across the treeless plain bearing food for themselves and their young and deposit here and there such seeds as compose their food. Each stump serves as a perch for one after another of these songsters; every rock and crag make favorite stopping places about which numerous seeds are sown.

Then squirrels come with their store of nuts for winter use, selecting choice spots for store-houses, which become well filled as these graceful creatures ply often from yonder nut trees to their hiding places.

The wind blows briskly, and thickly fly the downy thistle, the cottony seeds of the willow and populus families; whirling with rapidity come the heavier winged seeds of liriodendron, ash and maples, which alighting here and there, bury their heads neath the soft mud of the water-soaked soil; further on the lighter seeds of elm are wafted, strewing the ground as with snow.

Seeds of herbaceous plants are scattered hither and thither, as the winds and birds gather them up from the verdant spots to be strewn where there are none. Gently the falling leaves from the adjoining forests, spread a light cover hiding the scattered seeds and affording protection from the elements. Soon the snowflakes fly thickly and fast; a mantle covers the land. As the surface is melted by the sun and frozen when night comes on, the snow crust forms an ideal play ground for the wind, which scattering the seeds from cones of hemlock, pine and spruce, drives them fiercely over the snow until they are caught by some obstacle.

Spring comes, with rains; the rushing waters overflow their banks, picking up the twigs with clinging seeds, bear them further down the stream, and spreading over the treeless wastes deposit them to sink into the yielding soil. With the warm, life-giving sunshine of spring the seeds thrust downward their rootlets, while upward reaches a bud, when two tiny leaves appear as harbingers of spring.

And thus a forest is born. Not in a day, or a year, for nature takes her own time and methods to accomplish her objects, yet in due time a natural forest covers the spot which accident or design had made barren. Here are beech, ash and maple, there a clump of elms, a walnut and hickory alternating with blackberry briars and elder, hemlock with pine; trees of mammoth proportions and shrubs of low degree; ginseng, violet and twining grape strive for space to spread their roots and display their peculiar attractions.

Yonder chestnut will afford abundant nuts for boys and squirrels; these hackberries, cherries, grapes and elderberries will feed the birds which planted them; that oak may become a knarled monarch among whose branches birds will twitter their songs of love, build their nests in safety and feed upon its countless acorns, which, as if to acknowledge its dependence upon the birds and small animals, it supplies in such abundance.

Certain birds plant nuts and acorns with systematic regularity, burying them neath the surface, one in a place, expecting ere long to find its food, either from an enclosed egg which will in time become a fat luscious worm, or else the meat of the acorn.

In Arizona the Blue Jays gather the pine nuts and bury them singly at a depth of an inch or more, in the arid sands. Here they are preserved for months, or until the snow has fallen and melted, moistening the seeds. In this manner the pinon is planted.

The wild cherry but for its tasty, juicy berries, as also the hackberry, would soon become extinct, or at least confined in narrow limits, but for the birds. These seeds have no wings to be borne by the winds; they do not readily float upon the stream; they would simply drop to the ground and spring up in thickets directly beneath the parent tree. But when devoured by birds they are distributed far and wide, the seedlings taking root wherever

a tree or rock or fence permits a bird to perch. Thus they are perpetuated and extended to various portions of the globe.

The aromatic seeds of the juniper or cedar, will only germinate under conditions of heat and moisture, such as are found in the crop of fowls; the shell being too hard for the enclosed germ to open; hence would fall to the ground and perish for want of moisture but for the birds.

The wild apple, pear and pulpy fruits are similarly transferred to distant points, thus insuring the perpetual propagation of such trees.

The beech with its savory nuts, as also chestnuts, chinquepin and other small nuts are borne to hiding places for food by birds and squirrels, while an ample share find their way to the ground, forming new forests.

The Cross-bill with its peculiar mandibles, opens the cones of pine, extracting the seeds, of which it is fond, and distributes many in flight.

Birds often practice the art of grafting. The mistletoe of Christmas-tide, living as a parasite upon the branches of large trees, has clusters of small white berries which contain the seed. These are transferred from branch to branch by adhering to the bill; the bird pecks into the bark to remove the seed which thus becomes engrafted into the tree.

Are the birds disturbed in the woods? So also the forest is constantly harassed by enemies which menace its destruction.

Age and decrepitude are common to trees as to animals; their existence terminate in decay. Were it not for nature's army of birds, aided by their allies, the squirrels, many sort of trees and plants would become extinct.

Boring insects penetrate the bark and wood, existing upon the sap of growing trees, and unless held in check by hungry birds, multiply rapidly and eventually destroy the forest.

Destructive bark beetles become so numerous as to completely girdle large numbers of pine trees. They live upon the cambium which forms the connecting tissues of bark and wood; their burrows encircle the trees and prevent the sap from ascending to support the foliage which withers and dies.

Woodpeckers, whose instinct excels the marvelous X-rays, discover the beetle beneath several inches of overlying bark and boring through thrusts in his long tongue drawing out beetles and larvæ.

In an official report, made to the Commissioner of the Land Office, of my visit to the Black Hill forests, I stated that in one tree eight inches in diameter, we counted and estimated 10,000 beetles and larvæ. The bark came off in sections, having been entirely separated from the wood by the insects. There were no woodpeckers, and few other birds, while one-third the entire forest was dead.

Aphides suck the juices from leaves and tender stems; a horde of worms infest the buds, devouring the vital organs of trees, birds are always on the alert; hungry they awake at early dawn to breakfast upon these enemies of the forest. Impelled by hunger they continue their labors all the day gathering in the flies, mosquitoes, bugs and worms, thus keeping them in subjection.

One battalion hovers around the Conifers in search of beetles; other scouts seek those enemies which curl the leaves and feed upon the juices; a regiment is kept on special service as snake and vermin destroyers; a large brigade is on duty watching for mice in the open fields by night, returning to

the forest during the day. In this way owls and hawks earn that living which human kind denies them, but shoot upon all occasions.

In return the forest affords shelter for the birds; their nests are built among the branches, hidden by leafy canopies from the intrusion of numerous enemies and sheltered from storms.

It is natural for all animal kind to seek seclusion at times; nesting places are sought safe from view; only in the thick woods can perfect security be found. Here insects abound, berries, fruits, nuts and oily seeds are in profusion; happy is their lot. Small birds without the forest have little chance for their lives, where animals of the cat tribe or birds of prey have every advantage.

With the disappearance of the forests bird food is insufficient; they are driven to the fields and slaughtered. The balance in nature being destroyed, insects increase immoderately and are driven to feed upon orchard and domestic trees in our gardens. So additional burdens are placed upon the husbandman who unwittingly contributes to his own misfortunes.

Fifty years ago the San Jose scale, codling moth, wooly aphis, plum curculio and a host of pests now so common, were not known, or gave so little trouble as not to attract attention while fruits of all kinds were abundant where there were trees.

Surely no one can imagine that these pests were created during the past half century; not all of them were imported from countries which had centuries ago cleared away their forests. No! they were intended to be kept in subjection by nature's laws, which invariably preserves a balance.

Destruction of forests reduces the number of birds and quite naturally insects multiply as a result.

Protect the birds; increase the forests, and insect pests will gradually cease their annoyance.

JOHN P. BROWN,
Secretary Indiana State Forestry Association.

SPRAYING ORCHARDS FOR INSECTS AND DISEASES.

BY FRANKLIN SHERMAN, JR., ENTOMOLOGIST.

The greater part of this article is devoted to a consideration of spraying as a means of protecting fruit trees from insects and diseases. As an introduction we shall quote in full, name and all, a letter lately received from a plain, practical farmer in Durham County, who took up spraying last spring, for the first time, at our advice, and who carried it out according to our directions. Here it is:

"BAHAMA, N. C., October 14, 1901.

"MR. FRANKLIN SHERMAN, JR., ENTOMOLOGIST, *Raleigh, N. C.*

"You doubtless remember writing to me the latter part of July or the first of August, asking what effect spraying had on my apple trees.

"I was not then prepared to answer, nor am I prepared to fully answer to my own satisfaction now, but will do the best I can.

"On the 4th of April I sprayed some of my trees partially (all spraying was done with the Bordeaux Mixture and Paris Green). The wind was so strong I could not spray as well as I wished.

"Again, on May 2d, I sprayed same trees well, and about seventy-five other trees. (By this time I could see benefit of first spraying by death of caterpillars, and greenness of leaves, etc.)

"On May 23d I sprayed all again.

"Now for the results:

"I had more matured apples than I have had in one season for the past ten years.

"Of course I had Bitter Rot and insect pests plenty, but not more than fifty per cent of what I have usually had.

"All trees sprayed are as green, or nearly as green, as they were in summer. Next to the ground they are as green as in summer.

"What I mean to say, is, the leaves are off of the top branches, while lower down few of the leaves are off.

"I sprayed one side of a large fall apple tree. (I got no apples, for it was not the tree's year to bear.) The side I sprayed is green to-day, while the other side has no leaves.

"To be brief, all trees sprayed are full of leaves, while those not sprayed are destitute of leaves.

"This is an off year with my trees. They were nearly all full of apples last year, but all that ripened after the Harvest apple were affected with Bitter Rot. This year I had, say, half a dozen trees that bore no apples last year, that were loaded with apples this year; some were affected with Bitter Rot, but not near so bad as heretofore.

"Another thing I have noticed (and here may be something for a scientist to think about): Apples on the top of trees, and wherever exposed to the full rays of the sun, are much worse affected with Bitter Rot than those covered, or fully protected from the rays of the sun by leaves. Indeed, I can not find an apple where I can be certain the sun has not shined upon it, that

is affected with Bitter Rot. I also observe that no apples are affected till they get about grown and begin to ripen.

"I am very well pleased with my experiment spraying this year, and will spray again next spring more thoroughly than I did the past spring.

"I have some Mattamuskeet trees full of apples now; limbs on the north side of tree, low down, where the sun could not get to them, are full of nice apples not affected, while other parts of the tree are affected.

"Yours truly, R. C. TILLEY."

It is needless to argue whether this farmer believes that spraying was profitable for him. He must be a strange fruit grower who is not convinced by such a letter.

SPRAYING IN GENERAL.

Within the last few months we have found that quite a number of our farmers and fruit growers are now interested in the matter of spraying, and we have thought it desirable to prepare this article for the guidance of those who are taking such an interest in the matter of protecting their crops from the ravages of insects and disease.

The time has now arrived when the best fruit and garden crops can no longer be grown unless they be protected from the insects that attack them. The truth of this statement was abundantly illustrated in the middle and eastern sections of the State this year with the apple crop, which was very much damaged by Codling Moth, Tent Caterpillars, Leaf Rust, Bitter Rot, Fire Blight, and to a lesser degree, by various other pests.

In some localities the writer has found that certain farmers had purchased spray pumps, but had in some cases found them unsatisfactory. This is not due to any fault in the principle of spraying, but because the farmers did not understand the requirements of the case. We found a farmer who grows many acres of tobacco, who was spraying for Flea-bugs with a hand atomizer, the tank of which holds not more than half a gallon. To anyone who is familiar with spray pumps and their uses, this condition is almost incredible. Such little pumps as here referred to answer fairly well for spraying a few plants, such as roses or ornamental vines in the yard or window, but are wholly unsuited for general field use. The farmer who buys one of these makeshifts for a dollar is paying a higher price for his results than the man who spends ten times as much on a serviceable spray pump. A good spraying outfit is a durable piece of farm machinery and should be purchased and cared for as such. No one would expect to buy a respectable plow for two dollars, neither can a good spray pump, at this time, be secured for a few cents. We are not objecting to the cheaper devices for the uses to which they are suited, but the idea of purchasing a pump which carries one or two quarts of the spraying liquid, for use on field crops, is based on a misconception. If many of our farmers have experimented in this way, it is no wonder that they have formed the opinion that spraying is too costly and troublesome a practice to be generally adopted.

There is another device on the market which is now attracting some attention. This is a lantern for trapping moths and other flying insects. We are told that this, or similar devices, are to exterminate the noxious insects and replace spraying. Some of our growers have purchased these, and

such as use them are usually enthusiastic over the *apparent* results. But the results are more apparent than real. Insects *are* attracted to lights, and hundreds of them are killed by these trap-lanterns, but it is only in very rare cases that any appreciable results will come from their use on the farm. A farmer who was very much pleased over one of these devices was telling me in glowing terms of the many moths that were destroyed by it. Of course it destroys them, but it destroys good and bad insects alike, and further, of what avail is this destruction when it comes to male moths, and females which have already deposited the eggs? The trap-lantern idea is old; it has been tested and assigned to its proper place, which is not a very conspicuous one. It has its uses, but they are not common.

It should be said that spray pumps are now made which throw a fine, misty spray, with which it is easy to completely wet an apple tree of moderate size, in a few minutes. It must be emphasized, however, that spraying must be done with absolute thoroughness. The most wasteful spraying, both in time and money, is that which is not thoroughly done. If you are spraying for scale insects, plant lice, or other insects that suck the sap from the plant, you must so apply the spray that it shall come into contact with the insect itself. If you are spraying for caterpillars, beetles, or other insects that chew the food, every portion of the leaf surface should be wet with the spray. This is practically impossible on trees of any considerable size, but, nevertheless, it should be the aim, and should be accomplished, so far as is possible. The one leaf or bud that is not covered by the spray, seems to be just the one that will be taken possession of by the first insect, or disease spore, that comes along. It does not answer to point the nozzle at a tree, squirt a few drops into the foliage, and then move on. The writer has known persons to spray in that way. Perhaps spraying does not pay under such circumstances!

Spraying does not make a crop. It is only a protection, or, as Professor Bailey says, it is an *insurance* against the ravages of insects and disease. In some seasons there will be no fruit when we spray, and on other years there will be good crops without the aid of sprays. But there will frequently be years when the man who sprays will have an abundance, while his neglectful neighbor has little or none. In almost every year there will be a profitable balance in favor of the spraying.

We do not expect to *exterminate* the insects and diseases in our orchards by spraying or any other method. What we do expect to accomplish is to hold these pests in check, and not allow them to ruin either the crop of any one year, nor the orchard itself. There will always be rots and rusts and caterpillars to fight, and you need not hope to spray for a few years, exterminate the foes, and then neglect the spraying. It must be maintained as one of the regular operations in the orchard.

Do not be hasty in coming to the conclusion that spraying is too expensive an operation for you to practice.

SPRAY PUMPS.

We challenge a thorough, fair test of the measures we recommend. They are founded on actual practice, and, when tested, we will be pleased if farm-

ers will report results to us, whether they be favorable or otherwise. Now let us talk about the pumps themselves.

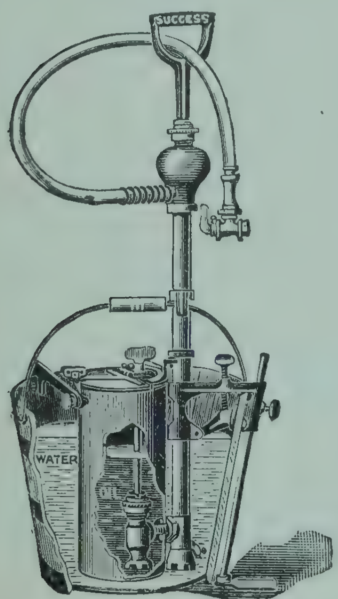


FIG. 1.—BUCKET PUMP.

Bucket Pumps.—(Fig. 1.)—These are the simplest and cheapest of the serviceable spray pumps. They consist essentially of the cylinder, piston, nozzle and a stirrup or foot-rest. The liquid is placed in a bucket. The pump is then put in the bucket, the foot-rest being outside, and by placing the foot on it, the pump is held steady while being operated. With spray pumps the hose that is furnished is usually about four feet long. For nearly all practical purposes a longer hose is necessary, and a seven-foot extra section can usually be had for about two dollars, from the pump-makers. Some of these pumps are furnished with a clamp, with which they are attached to the bucket, while others are lifted from the bucket while moving from place to place, or stand loosely in it. Those which are provided with a clamp are preferable, but are, of course, a little more costly.

Bucket pumps are good for limited use, as for experimental purposes, or for use on a few fruit trees or vines. For use on not more than twenty or thirty trees, a dozen vines, and very few Irish potatoes (these are the plants

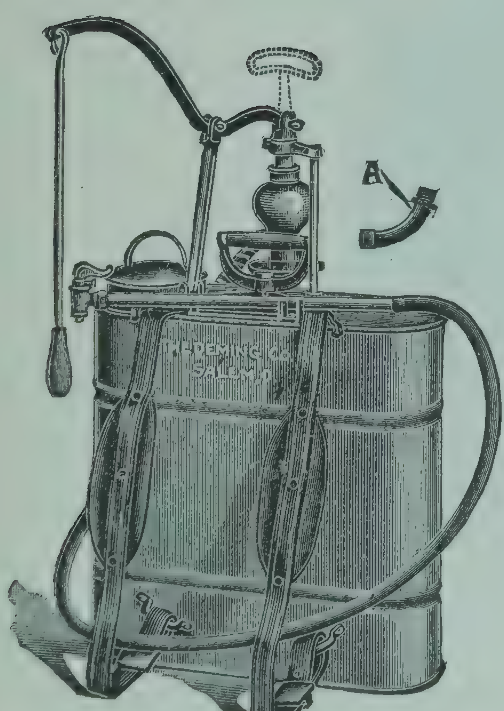


FIG. 2.—SIMPLE KNAPSACK PUMP.
(The Deming Co.)

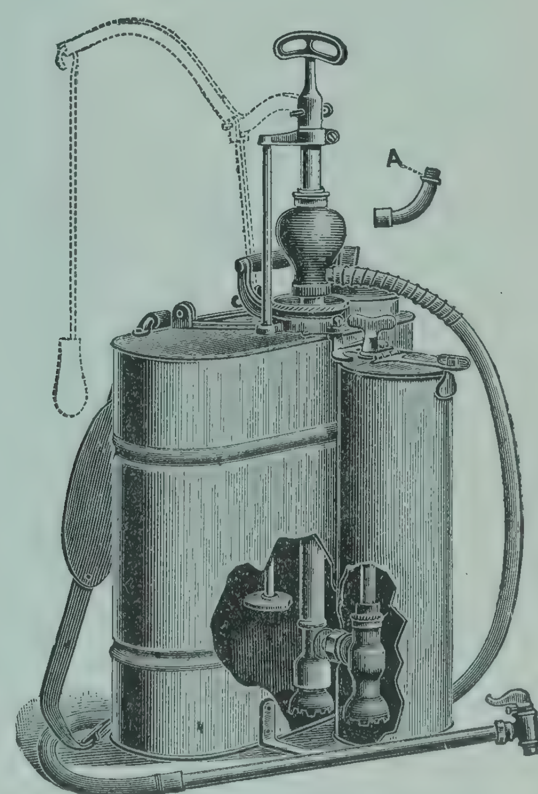


FIG. 3.—KNAPSACK PUMP.
Provided with separate tank for oil. Such an arrangement does away with the necessity of making kerosene emulsion by hand.
(The Deming Co.)

which nearly always give profitable return for spraying) these pumps are very serviceable. They are also of use to the farmer who is not convinced of the value of spraying, and wishes to try it, but who does not wish to purchase a more expensive pump. The price of these pumps, with hose, nozzle and all complete, ranges from $2.00 to $7.00.

Knapsack Pumps.—(Figs. 2 and 3.)—These are the pumps that are most desirable for general garden use. With these the pump and tank for carrying the liquid are combined into one piece of machinery, and the whole is fitted to be carried on the back, straps passing over the shoulders and under the arms. The pump-handle hangs down in front of the operator. These are most desirable for spraying low-growing plants, such as potatoes. They are also good for use on grapes and are used for apple and other fruit trees, but they are not always best for doing work in which the operator has to stand perfectly erect, with the head turned upward, as is necessary when spraying large fruit trees. In such cases, the weight on the back is apt to give some difficulty in maintaining his balance. However, they are advisable for any amount up to 75 or 100 trees, and are by all odds best for potato patches and vineyards of ordinary size, and for general use in the family garden. Prices vary from $10.00 to $20.00.

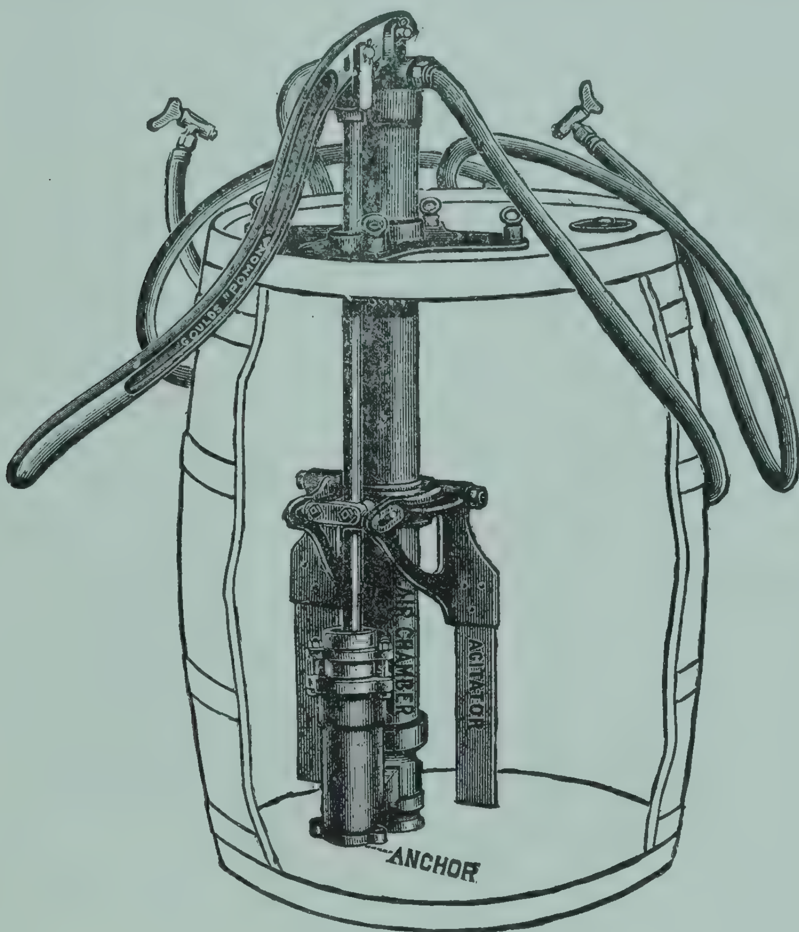
Barrel Sprayers.—(Figs. 5 and 6.)—These are not essentialy different from

FIG. 5.—SIMPLE BARREL SPRAYER.
(The Deming Co.)

the preceding, but the pumps are usually stronger and are mounted in larger and stronger barrels, or in tanks, intended to be placed in a wagon or cart and drawn by horses. These are the pumps used mostly in the large commer-

cial apple orchards, and are to be recommended for orchards containing over 100 or 200 trees. Prices vary from $20.00 to $35.00.

We advise our farmers to secure catalogues on spraying apparatus from the following firms, and study them closely to see which pumps will be best suited for their use. Ask definitely for their catalogues on *spraying apparatus*, as otherwise you may get a catalogue on steam pumps, well drills, etc.



(FIG. 1100)

FIG. 6.—BARREL SPRAYER WITH TANK FOR OIL.
(The Deming Co.)

Some of these catalogues contain valuable articles on spraying, which are also recommended to full consideration. They are written by men who know whereof they speak. We know all the firms here listed to be honorable, and we recommend them to your consideration and patronage:

Goulds Manufacturing Co., Seneca Falls, N. Y.
Deming Co., Salem, Ohio.
P. C. Lewis Co., Catskill, N. Y.
Field Force Pump Co., Lockport, N. Y.
Morrell & Morley, Benton Harbor, Mich.
H. B. Rusler, Johnstown, Ohio.

We often hear the complaint that spray pumps cost too much. To this we can only say that they are *worth much*, and that it costs a good deal to make them. The working parts have to be of brass, if the pumps are to endure,

and the machinery of a spray pump is usually more or less complex. It is for these reasons that we condemn the flimsy excuses, when it comes to spraying farm crops. Whether or not a spray pump is too great an expense must depend largely on how much you value your trees, vines and garden crops. If you have only a few half-starved trees and do not intend to treat them fairly, but expect them to bear while being robbed by weeds and grass, while you devote your entire attention to your cotton, tobacco or grain, then, of course, a pump costs too much. But if you take a pride in handsome trees, and fine fruit, you will never regret the expense of a good pump. Such a pump is a piece of improved farm machinery, and should be housed and cared for accordingly.

SPRAYING MIXTURES.

General Considerations.—There are a number of different spraying mixtures, each suited for definite uses. No one mixture is good for all troubles, though we are able to combine mixtures so that they are sometimes good for many ailments at once. A most remarkable example of this is the combination of Bordeaux Mixture and Paris Green, which is the most widely useful of all spraying preparations.

We may say that, in a spraying mixture, (1) if Blue Stone (Copper Sulfate) is used, it is to kill the blights, rusts and other *diseases* that attack the plant. (2) The use of Paris Green is to kill caterpillars, beetles, and other *insects that chew the food, and eat the actual tissues of the plant.* (3) Lime is useful in keeping the Paris Green from settling to the bottom of the vessel or tank, and also to prevent Paris Green or Blue Stone from burning the foliage. (4) Kerosene and other oily sprays are to be used against plant lice, scale bugs, and such other insects as *suck the sap* and *do not* eat the tissue of the plant. If the farmer will remember these four points it will aid him greatly in solving his spraying problems.

BORDEAUX MIXTURE.—FORMULA.

Blue Stone	5 lbs.
Lime (fresh)	5 lbs.
Water	50 gals.

Directions.—Put 5 pounds of Blue Stone in a coarse cloth sack and suspend it in 3 or 4 gallons of hot water. Work with the hands occasionally to hasten dissolving. When dissolved, pour into a clean barrel and add water to make 25 gallons. Now slake 5 pounds of lime, adding the water slowly in slaking so as to avoid grits in the lime milk. When the lime is completely slaked, pour into a clean tub or keg and add water to make 25 gallons. Now pour this into the barrel with the Blue Stone, and stir thoroughly. This makes 50 gallons. If you do not wish to make as much as this, you may reduce the amounts, but the proportion should be kept about as indicated.

Test for Bordeaux.—It is now desirable to test the Bordeaux to see if there is plenty of lime present to prevent the Blue Stone from burning the leaves. For this we use *Dissolved Ferrocyanide of Potassium.* Any druggist can supply this material, and a gill is enough to make all necessary tests for a year or two. Add a few drops of this to the mixture without stirring, and if it makes a purple or crimson color, more lime milk should be added until no color results from the test.

Bordeaux Mixture and Paris Green.—In preparing this material we make the Bordeaux exactly as prescribed in the foregoing formula, and then add one ounce of Paris Green for each 10 gallons. The Green is first placed in a china bowl or cup and mixed with a little water to form a thin paste, which is then poured into the barrel of Bordeaux, stirring the whole *thoroughly*, so that the poison shall be distributed throughout the whole barrel.

PARIS GREEN AND WATER.—FORMULA.

Paris Green	1 ounce
Lime (slaked)	1 ounce
Water	10 gals.

Directions.—Mix the lime with water in a bowl to make a thin paste and pour into the water; stir thoroughly. Now do likewise with the Green. Stir.

KEROSENE EMULSION.—FORMULA.

Kerosene	2 gals.
Water	1 gal.
Soap (Ivory preferred)	½ lb.

Directions.—Shave the soap into thin pieces into the water. Place on stove and heat almost to boiling to dissolve the soap. *Remove from the fire* and pour in the kerosene and churn the mixture very thoroughly with the pump, by turning the nozzle into the vessel. This gives an emulsion of 66 per cent kerosene, which may now be diluted with water to the strength desired.

Note.—Several dealers in spraying apparatus make pumps which have a separate apartment for oil, and which make a fine mechanical mixture when sprayed. Of such pumps, those made by the Goulds Co. (see list) seem to be *slightly* the most reliable. With such pumps the trouble of making Kerosene Emulsion is avoided. The pumps may be so geared as to throw any strength of emulsion that is desired.

USES OF THESE MIXTURES.

Bordeaux Mixture is used against Leaf Rust of Apple, Apple Scab, Peach and Plum Rot, Bitter Rot of Apple, Black Rot of Grape and like diseases. It is not of use against insects.

Bordeaux and Paris Green is used against the same pests as just named for Bordeaux, and also for Caterpillars, Potato Beetle, Apple Worm, Elm Leaf Beetle, and such insects as devour the tissue of the plant.

Paris Green and Water is used only against those insects that chew the food, as named under the preceding head. It is not of use against Blights, etc. Generally Paris Green is used in the Bordeaux Mixture, but in some cases, as in fighting the Flea Beetles on tobacco, it is better to use it without the Bordeaux.

Kerosene Emulsion is used against such insects as suck the sap from the plant. These are not affected by the other spraying mixtures.

POINTS ABOUT SPRAYING.

Spraying Mixtures must be kept in agitation, or the ingredients will settle or become separated. On this account it is always better to have a pump

which is furnished with an *automatic agitator.* Bucket pumps do not have these, and when they are used the mixture must be stirred every few minutes with a stick. Barrel sprayers are nearly always furnished with automatic agitators. The agitator is one of the most important parts about a complete spray pump.

In spraying into the tops of high fruit trees it is best to tie the nozzle on the end of a pole long enough to enable one to do the work thoroughly.

A tree should certainly be sprayed thoroughly from two sides, and if from three directions the results will be much more satisfactory.

THE GOOD ROADS CONVENTION.

Two notable meetings have recently been held in the State, both of the same character, and both with the same objects in view. One in Winston-Salem, the other in Asheville.

These meetings were Good Roads Conventions, conducted under the auspices of the National Good Roads Association.

Besides the officers of this Association, the Government Bureau of Roads Enquiry and the State Highway Commission were represented, Professor Holmes taking an active and useful part. The officers of the National Association had with them a train-load of necessary machinery for building a section of *good road*. This machinery includes plows and scrapers, stone crusher and engine, road-roller, etc. At each place a sample good road was constructed, the county authorities furnishing the needful hands, wagons and teams for hauling the rock and making the road-bed. This actual road making was a practical object lesson of great interest and value to the large number attending the conventions.

It is not the purpose here to give a detailed account of the proceedings, but rather to refer to the general trend of sentiment which marked the discussion of the road question.

No sane man denies the need of good roads. How to get them is the problem.

The Proper Grading and Locating of Roads.

When the country was young and sparsely settled the roads were usually located with reference to the convenience of families and to save work in constructing. In the hill and mountain country the road went over the hills instead of around them. Grades of 10 and 15 per cent were not uncommon, and many of them still exist. Roads were located over steep hills and around fields to save fences and as a matter of convenience to the landowners. The rule was to consult private convenience, rather than the good of the road and public necessity. The whole system of road location needs change and amendment. And the first principle of road location is the public good. If the present road is not in the right place, it ought to be changed and put in the right place, even if it does take some of Mr. Jones' land, or does not suit the convenience of Mr. Smith. The adoption of the no-fence law in most of the State simplified in great measure the question of road location. On the new roads that have been and are being constructed in the mountain country (I mean *real roads* and turnpikes) oftentimes in the most rugged places there is scarcely a grade of over 5 per cent—that is, one foot rise to twenty feet in length. This shows what can be done when a road is located by a competent engineer, as all roads must be, instead of in the old bungling fashion by a jury, who frequently locate the road almost anywhere to suit a neighbor's convenience, and with little or no reference to the good of the road or the advantage of the public travel.

Work of Convicts on the Roads.

In the discussions it was evident that a strong and growing sentiment exists in favor of working convicts on the roads; and to the minds of some

that seemed to be the solution of the whole question. Some of the larger and more wealthy counties have already adopted this plan, and are working the convicts to great advantage. In Mecklenburg, Forsyth, Gaston, Buncombe, Iredell, Rowan, Durham, Wake, Guilford and others of the larger counties the plan is effective, and although progress is slow, the work done is permanent. This system is not adaptable to the smaller counties. In the first place, if all the State convicts were divided out for working the roads, only ten or a dozen would be allotted to the county—too few to be worked profitably—with the expense of guarding, feeding and clothing to be taken in account. But suppose the allotment of convicts to two or three counties were worked together, first in one county and then in another, how long would it take thirty hands to work the roads in three counties, to relocate where necessary, dig side ditches, put in drains, build bridges, blast rocks, etc.? The question, to one who knows about working a road, needs no answer.

This article is not opposing the idea of working convicts on the leading thoroughfares, but it is too plain for argument that the roads of the country will never be put into and kept in good condition by the use of convicts alone—even if every able-bodied convict in the State is set to work. The roads generally are in desperate condition, and it is *now* that work is needed. Farmers, lumber haulers, wagoners, and everybody who travel, are suffering and losing money every trip they make for want of better roads.

There is only one way to get them. The people must be brought to realize the absolute necessity of good roads, must understand their money value, must feel the loss they constantly suffer from having bad roads, and must set to work and make good roads themselves. And this is to be done by

TAXATION.

It is unjust, unfair, unreasonable and disastrous in results to expect to keep up a system of good roads under the old method of poll-tax—that is, of requiring the same amount of road service from one man as from another—from the man who doesn't own a tool fit to work the road with and who never uses the road except on foot, as from the man who owns lands and horses and wagons and buggies and who makes use daily of the roads. Every man is interested in and benefitted by having good roads, whether he is a property owner or not, and should be required to contribute his share of work to the general welfare. But this is not enough. The property of the county, the value of which is directly affected by the road question, must be made to pay an equitable amount before we will ever get out of the mire and ruts of bad roads. Such taxation is an investment, and adds to the value of property. The money is all (or nearly all) spent at home, in the township. The people are none the poorer, for no money has been taken away, while the roads are better and the value of property is increased.

THE VALUE OF GOOD ROADS.

Perhaps the most convincing proof of the value of good roads is the experience of those who have built them. Most of us are not acquainted per-

sonally with *good* roads, and can not speak from experience. The great county of Mecklenburg is the pioneer of the good roads movement in North Carolina. In the beginning, much opposition was manifested to the movement, especially on the part of the town people, who did not want to be taxed to make country roads, and they said they had no interest in them. They have found out differently. Many country people thought the money spent was a useless extravagance. They have found out differently. It may be safely said, on reliable authority, that every class of people in Mecklenburg County, in city and country alike, now favors the system which has given the county such splendid roads; and that the people, as a whole, would not go back to the old mud and mire for five times what the roads have cost.

There is plenty of labor in the county to build and maintain good roads, if properly utilized. A few days' work a year, under competent direction, supplemented by a reasonable tax on the property, would, in a few years, make a marvellous difference. It is not to be expected that all the counties can at once undertake macadam or stone roads; most of them can not, except in the worse places; but such a vast improvement may be made in the common dirt roads, and it is these which must be our first concern.

This road question is the most important question now confronting the people of the State. The country people are vitally interested in it, not only from an economic, but from a social standpoint. The pleasure and advantages of country life would be so greatly multiplied if neighbors had easy access over good roads to one another's houses, if the children could get to school, if all the people could go to church.

We are *not* too poor to build good roads. We *are* too poor to do without them and prosper.

SILK CULTURE.

BY GERALD McCARTHY, BOTANIST AND BIOLOGIST.

I.—HISTORY OF SILK CULTURE.

Silk, the finest and most valuable of textile fibers, is the product of a small caterpillar, the larval form of moth, *Sericaria* (*Bombyx*) *Mori*, a native of China. The modern silk-worm is in the truest sense a domesticated animal. The species in the wild state seems to have ceased to exist ages ago. There is but a single species of the cultivated silk-worm, but this species has many varieties, some of which produce white silk, some green silk, and others yellow silk. There are also very numerous cultural races—each neighborhood in old silk-growing countries having a special race, usually called after the town or province. There are numerous wild moths which

FIG. 1—MULBERRY SILKWORM, COCOON AND MOTHS.

also produce silk, but none of them can compete with the cultivated silk-worm. The domestication of the silk-worm took place in China about B. C. 2700. History relates that the Emperor Hoang-Ti, of that country, had a brisk and inventive wife, by name Si-ling Chi. The Empress had, it appears, a special talent for meddling with State affairs, and became such a public nuisance that she was at last advised by her husband, in words afterwards used by Shakespeare, to "Go spin, you jade, go spin." The excellent woman, taking her lord at his word, and not finding any spinable fiber handy, went into her garden and gathered a large number of worms she saw spinning cocoons on her mulberry trees. From the fiber spun by these worms she made silk thread. She next invented the silk reel and method of reeling the fiber. She finally improved the old wool loom and fitted it for weaving silk. On this loom, with her own imperial hands, she wove the first piece of

silk cloth the world ever saw. This cloth she presented to the Emperor, who thereupon issued an edict directing all gentlewomen in China to cultivate silk-worms and to pay divine honors to the Empress Si-ling Chi. These things are so done in China to this day. From the days of Si-ling Chi, silk growing in Eastern countries has been the special province of women and the younger members of the household.

From China, silk culture spread to India and Japan before the Christian era. It was introduced into Europe at Constantinople during the reign of the Emperor Justinian, about the year 550 A. D. Two Nestorian monks, returning to Constantinople from China, brought samples of silken cloth, which they presented to Justinian. The Emperor sent the monks back to procure eggs of the silk-worm, and to learn how to care for the worms and prepare the silk. The monks brought back with them a few hundred silk-worm eggs, hidden in a hollow bamboo cane. From these eggs are descended all the European races of silk-worms—which have brought prosperity to many nations for over 1400 years.

Silk culture was introduced into Italy in the thirteenth century, and silk has ever since been the chief and most profitable agricultural product of that country. It has always been protected and encouraged by the princes and governors of Italy. Silk-worms were brought from Lombardy into France in the seventeenth century, and the industry was encouraged by Henri IV., the reigning monarch. It was finally established in the reign of Louis XIV., by the enlightened policy of the great French statesman, Jeane Baptiste Colbert.

Silk-worms were brought to Mexico by the monks who accompanied the army of Cortes in 1522. The greed of the Spaniards for gold, however, caused silk growing to be soon abandoned in Spanish America.

James I., of England, in his famous "Counter-blast against Tobacco," recommended the Virginia colonists to cultivate silk-worms instead of the poisonous weed. He further encouraged the industry by offering premiums for colonial silk, and by publishing the following lines, more remarkable, perhaps, for good sense than poetry:

> "Where silk-worms and food do naturally abound
> A gallant trade in silk must sure be found.
> Virginia excels the world in both,
> Envy and malice can gainsay this truth."

But the superior profits of tobacco and the scarcity of domestic labor prevented the honest monarch's advice from bearing fruit in colonial Virginia.

Silk-worms were brought to Carolina and Georgia by the first settlers, and the industry quickly took root. For over thirty years these two colonies exported considerable quantities of raw silk to London. A silk-reeling mill was established at Savannah in 1750. In the year 1795 over $75,000 worth of raw silk was exported from Savannah.

The Huguenots who settled in the region about Charleston, S. C., in 1677, introduced silk culture, and for nearly a century from $5,000 to $10,000

worth of silk was annually exported from Charleston, in addition to what was woven and consumed at home.

The Revolutionary War caused the silk industry in America to languish, but at its close Franklin and other patriots took active measures for reviving it. The New England State of Connecticut, in 1783, offered a bounty to silk growers, and the industry soon became so considerable that for many years, up to 1830, that State produced more silk than any other State in the Union —the output exceeding in value $200,000 per year.

In 1826 the United States Secretary of the Treasury, Richard Rush, caused to be prepared and published a Manual of Silk Growing, which was for many years the standard American authority. Silk growing soon became very popular in all the Atlantic coast States. From 1835 to 1840, large nurseries of the Chinese mulberry—*Morus multicaulis*—were planted, and a speculative craze set in. Yearling trees of this variety were bought and sold for $2 to $4 each. In the winter of 1840 a very severe frost destroyed hundreds of thousands of these young trees, which were now found to be not hardy above Washington. The speculation in trees collapsed. Hundreds of silk growers who had paid fancy prices for the trees were ruined. Silk-growing in the United States received a set-back from which it has never recovered.

The New England silk growers, instead of planting a hardier variety of mulberry and recovering their lost fortunes, now turned to silk weaving, using imported raw silk. During the Civil War there was a tariff duty of 60 per cent *ad valorem* on imported silk cloth, whereas the raw or reeled silk came in free. This gave an enormous stimulus to American silk manufacturing. The census of 1900 showed in operation in the United States, 483 silk mills, having a total capital of over eighty-one million dollars; an annual output valued at over one hundred and seven million dollars; 65,000 hands were employed, and over twenty million dollars was paid for labor.

A Treasury report for 1900 shows that in that year there were imported into the United States, duty free, 13,043,714 pounds of reeled silk, valued at $45,329,760. During the same year there was imported manufactured silk cloth to the value of $30,894,373. On this manufactured silk there was collected an *ad valorem* duty averaging 54 per cent.

Practically no American-grown silk was put upon the market in the census year 1900. The cause of the substantial extinguishment of the silk-growing industry in America will be considered in the chapter dealing with the Future of the Industry. Suffice to say here, that the decline of the industry in America was not due to climatic causes, nor to the lack of available labor, nor the lack of worms or mulberries upon which to feed them.

The world's production of raw silk in 1890 was as follows:

Italy	7,845,400 lbs.
China	6,492.200 lbs.
Japan	3,080,000 lbs.
India	2,224,200 lbs.
France	1,755,600 lbs.

Austria	675,400 lbs.
Spain	376,000 lbs.
Greece	303,600 lbs.
Other countries	267,500 lbs.

II.—THE FOOD OF SILK WORMS.

The natural food of the silk worm is the leaves of the white mulberry—*Morus alba*, and its varieties. The red and black mulberries are less suitable. The so-called paper, or Otaheite mulberry of the Southern States is not a true mulberry, and is worthless as food for silk worms. The osage orange—*Maclura auriantica*—a tree very closely related to the mulberry, makes excellent food, but is too succulent and is liable to cause disease.

The leaves of the garden lettuce and garden scorzonera are often used as food for silk worms. They do very well for a few days, but the worms do not thrive when fed exclusively upon these plants. The white mulberry and its varieties must always remain the standard food plant for silk worms. Silk culture can never be made profitable where these trees do not thrive. There are numerous varieties of the white mulberry, of which the best are the following:

1. *Morus alba*—the white mulberry. A small tree, growing about forty feet high. Leaves ovate, thin, smooth, glossy on both sides. Acute at apex, rounded at base, toothed or lobed on edges. Leaf stalks slender. Flowers white or pinkish, in unisexual, drooping spikes, appearing in May. Fruit white or red, edible, but insipid, ripe in July. Hardy everywhere from Ontario to the Gulf, and from the Atlantic to Pacific.

2. *Morus alba. var. multicaulis.*—The Chinese mulberry. This is a smaller tree, but resembles the above species, except that it has larger and thinner leaves and black fruit. It is very fine food for silk worms, but it not entirely hardy north of the Potomac River. It is very common in central North Carolina, dating from the speculative craze of 1840.

3. *Morus alba. var. moretti.*—Italian, or Dandelo, mulberry. This is a shrub, less hardy than the preceding, but is fine food for the silk worm. The Moretti mulberry is much planted in Italy and France, where it is usually grown in form of a hedge. It is hardy in North Carolina.

4. *Morus alba. var. Downingi.*—Downing's Ever-bearing mulberry. This is a seedling of multicaulis grown by the eminent horticulturist, Charles Downing. It bears for six or eight weeks of summer edible fruit of the finest quality. As food for silk worms it is equal to any. It makes a very beautiful shade-tree, resembling the Chinese variety. It is hardy as far north as Long Island. Does not sucker. This is the mulberry *par excellence* for the Southern silk grower. It does best planted in orchards about 20 by 20 feet.

5. *Maclura auriantica.*—The osage orange. The osage orange is a close relative of the mulberry. It is extensively grown in the South and West as a hedge plant. It bears large and sharp thorns. This tree is rarely grown as a standard, but when it is it makes a beautiful tree of 30 feet height, with a spread of boughs of 50 to 60 feet. It is hardy as far north as New York City. Makes good food for silk worms, but rather succulent and liable to cause indigestion. Not as valuable as the mulberry, but it will be desirable to have a few trees of it for variety.

6. *Scorzonera hispanica.*—The oyster-plant. This is a hardy perennial herb of the composite or daisy family. It is commonly grown in vegetable gardens for its root, which in shape resembles a parsnip, but tastes like a very insipid oyster. It seeds abundantly, and when cultivated it is usually sown afresh every two years. It is perfectly hardy everywhere in the United States. This plant has recently been much praised by Russian scientists as food for the silk worm. It is claimed that the silk produced by worms fed on this plant is equal to the best, and moreover there is less disease among the worms and less loss by stained cocoons than when the worms are fed upon mulberry leaves. Scorzonera can be grown as an annual in any climate that produces wheat. We do not recommend scorzonera as a substitute for the mulberry,

FIG. 2.—THE DOWNING MULBERRY.

but it will be well for all silk growers to have a small bed of this plant for early use when the mulberry may be retarded or nipped by late frosts. The leaves are cut and fed in same way as those of mulberry.

7. *Lactuca sativa.*—The garden lettuce. Lettuce leaves have often been used as a temporary food-plant for silk worms. Any variety of lettuce will do, but those having hard and less succulent leaves should be preferred.

All of the mulberries thrive best on a dry sandy or gravelly soil, which must be rich in plant food. The osage orange prefers a somewhat moist, clayey soil. All these trees grow readily from seed and from cuttings. The osage orange and the Moretti mulberry should always be grown in hedge form. The Downing, multicaulis and white mulberries may be grown as low-branching trees or shrubs.

For a hedge, plant the rooted cuttings or rooted seedlings in rows two feet apart in the row. Usually the hedge is used as a fence around a plot of ground, but it may be grown in rows 10 feet apart. For the shrub form, plant 15 by 15 feet, and make the plants branch from the ground. Prune back severely every second year. The leaves should not be gathered before the plants are three years old, and after that gather only on alternate years. The ground should be kept cultivated from early spring until July, then sow the

middle of row in cow-peas. Chickens or hogs may be allowed to run in a mulberry orchard, as both are very fond of the fruit. Poultry and silk worms go well together, and make a good, all-the-year-round business.

The best fertilizer for mulberry trees kept for silk-worm food is a mixture of one-half kainit, one-quarter acid phosphate, and one-quarter nitrate of soda. Where fowls are kept in the orchard, less nitrate will be needed. The double sulphate of potash and magnesia may be substituted for kainit.

III.—REARING THE SILK WORM.

There is but one species of the cultivated silk worm, but there are many varieties of this species named after the color of the cocoons, and a still greater number of cultural races. Every important silk-growing district has a special race, which is believed by the local inhabitants to be superior to all others. Among the best-known of these races may be specified the Umbrian, Ascola and Marches races of Italy, and the Cevennes, Var and Pyrenees races of France. The Italian races are more prolific, but less hardy than the French. Italian raw silk is admitted to be superior to the French, and vastly better than the Chinese.

In describing the life history of the silk worm, we will begin with the egg, in which form a start is usually made in this business. The eggs can be bought in the market. They cost about $2.00 an ounce. The eggs of the silk worm are yellowish, and about the size of a mustard seed. During incubation they change color, becoming violet or green. The common unit used in speaking of silk-worm eggs is the ounce. The standard ounce is equivalent to 25 grammes, and contains about 40,000 eggs. The mother moth lays between 300 and 400 eggs, so that it requires 100 females to produce one ounce of eggs. But as the insects mate but once, there must be an equal number of males in order to have fertile and viable eggs.

The progeny of one lot of eggs placed to incubate at same time is called an "education." For convenience and to save time, it is very necessary that all the eggs of one batch or "education" shall be of equal vigor and general constitution, in order that they may go through their various metamorphosis and changes at same time. To insure this, eggs from different sources should not be mixed together.

Though the eggs of the common annual silk moth are produced in early summer—usually June—they will not hatch until they have passed through the regular seasonal variations of temperature, nor in any case can they be made to hatch until after six months. After February 1, however, a warm spell of weather is liable to start the dormant life process long before the mulberry or other food is available. To prevent too early hatching, it is the custom in Italy to send the worms from the lowlands, where most of the silk is grown, into the cold valleys of the Alps during the month of January. Here the worms are subjected to a temperature usually many degrees below the freezing point—often 10 degrees F. The same condition is effected by putting the eggs into a refrigerator for about a month. This period of severe cold is thought to harden the worms and make them less liable to disease. So long as they are kept dry, no ordinary amount of cold will injure the eggs. But the more severe the cold, the slower the eggs are to hatch when put to incu-

bate. On no account should the eggs be kept at or near a uniform temperature during their dormant period. The silk worm is not a tropical insect. It is habituated to climatical variations of temperature, and when these fail the eggs spoil. The eggs must not at any time be exposed to strong or direct sunlight. The period of incubation is about six days, at a temperature of about 73 degrees F. When the eggs are set to incubate, the temperature must be gradually raised, beginning with the natural temperature, which is, in the first week of April, about 48 degrees F. Increase slowly to 55 degrees F. during first 6 days. Hold it so for 4 days, then increase one degree per day until it reaches 67 degrees F. Hold it so for 2 days. Then increase one degree per day until it reaches 72.5 degrees F. to 73 degrees F. and hold it so until eggs hatch.

The eggs will usually hatch in six days after the temperature of 72 degrees F. is reached. The whole period from first raising the temperature above the temperature of the season to the hatching should be about 20 days. There-

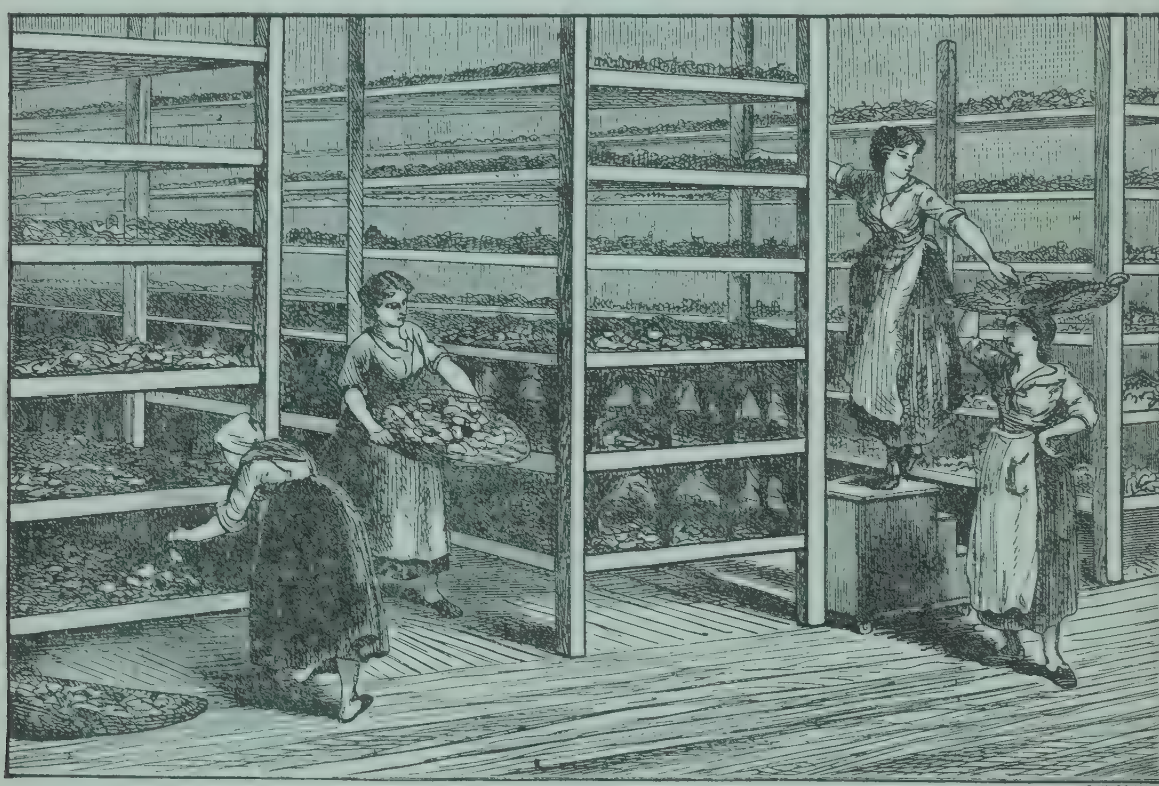


FIG. 3.—BREEDING ROOM FOR SILK WORMS.

fore, in North Carolina the start should be made about April 10, so as to bring the worms by May 1. It is very desirable to have the worms out as early as food can be had for them in order to escape the heat of June during the spinning-up process. The silk worm is unable to stand much heat.

An ordinary chicken incubator may be used for hatching the eggs, or a small room which can be well ventilated and kept dark may serve; a small stove may be used to heat the room. The floor of room must be frequently sprinkled in order to keep the air moist. In an incubator, use a wet sponge, as in hatching fowl's eggs. A good incubator in which the temperature is regulated automatically is the safest and best way to hatch silk-worm eggs.

The eggs usually come to hand glued by the mother insect to squares of cloth—each square having about 300 eggs (see Fig. 6). To incubate, these cloths are simply laid upon shelves, or better, on a lattice frame which allows the air to circulate freely on all sides. A room in an attic with a northern window is the best incubating room. While the eggs are incubating, the rearing-room must be carefully and thoroughly cleaned and disinfected. First, scrub all the woodwork with soap and hot water. After it has dried, fumigate with burning sulphur, using 3 pounds of roll brimstone to each 1,000 cubic feet. A room 10 by 10 by 10 feet contains 1,000 cubic feet. To fumigate, break the sulphur into small pieces. Place in a heavy iron pan. Float this pan in a tub of water in the room. Throw upon the sulphur a shovel of hot coals and quickly vacate the room. The room should have been made air-tight. Let stay closed 12 hours. After fumigating, the walls should be whitewashed. The most scrupulous cleanliness must be maintained during the entire "education" of the worms.

The question of space is one of very great importance in raising silk worms. The worms are very small at first, but they increase rapidly, and the space they occupy must be extended in proportion. Silk worms must never be stinted in room. At birth, a silk worm weighs about 1-100 grain. After first molt, when 5 or 6 days old, it weighs .15 grains. After second molt—8 to 10 days old—it weighs .94 grains. After third molt—15 or 16 days old—it weighs 4 grains. After fourth molt—21 or 22 days old—it weighs 16 grains. When ready to spin up—30 to 33 days old—it weighs 95 grains.

There are many ways of arranging the worms for feeding. In small "edu-

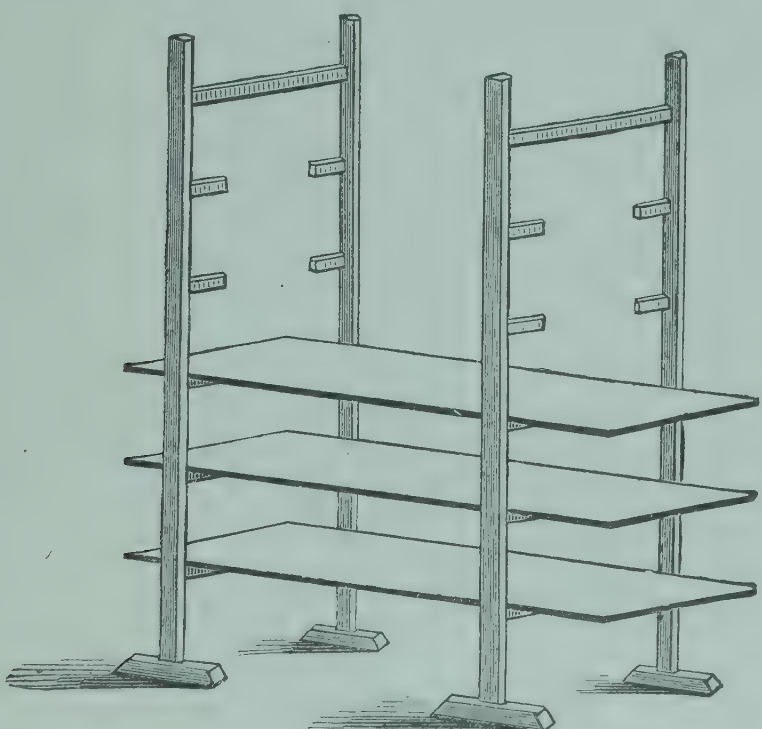


FIG. 4.—SHELVES FOR FEEDING SILK WORMS

cations," a good way is to have light wooden trays, with bottoms of cheese cloth or soft manila paper perforated with holes just large enough for the worms to climb through. The holes may be increased in size as the worms

grow. These frames or trays have blocks or feet at corners to raise them a little from the surface and allow a free circulation of air. Worms are voracious consumers of oxygen as well as leaves. A good size for these trays is 1 by 3 feet. When the eggs on the cloth squares begin to hatch, lay a square on a table and place over it and just above it one of the trays, right side up. In the tray place some fresh-chopped mulberry or scorzonera leaves. The young worms will, as soon as hatched, climb through the holes in the bottom of the tray into the tray and upon the leaves. As soon as the tray is one-fourth occupied, remove it and place a fresh tray. The eggs usually begin to hatch early in the morning. The period of active escape from the shells may continue for several days, but the worms of each 12 hours hatch should be kept separate. The eggs not hatched at the end of the third day from the first hatching should be thrown away, as too weak to produce vigorous worms.

One or more rows of shelves or movable standards should be arranged in the center of the breeding-room—never along the sides. It is impossible to give the room too much fresh air. But too much light is injurious. The temperature must be carefully regulated. Until the first molt, keep the temperature of breeding-room about 73 degrees F.; after first molt, increase to 75 degrees F.; after second molt, increase to 76 degrees F.; after third molt, 78 degrees F.; during last ten days, make temperature 80 degrees F.

Keep worms at all times free from their own excrement, and from stale, dried-up leaves. Fresh food should be given whenever the last feeding is consumed or withered. The cultivated silk worm is simply a machine for transforming leaves into silk. The more it eats, the greater the harvest and the larger the profit. The silk worm as an eater is worthy to bear away the palm even from a school boy. It eats and sleeps not. At least five feeds per day must be given, viz., at 5 a. m., 9 a. m., noon, 4 p. m., 9 p. m. During the last age, 7 or 8 feeds must be given. Experience has shown that an average "education" of silk worms will, at the temperatures above noted, molt for first time about 5 days after birth. The intention to molt or cast the skin is shown by the worms ceasing to eat, becoming restless and standing with uplifted head and tail. No food should be given after any worms in a tray show these signs of molting. The periods between successive molts are called ages. Silk worms pass through 5 ages, lasting about as follows: First age, 5 or 6 days; second age, 4 or 5 days; third age, 5 days; fourth age, 5 or 6 days; fifth age, 8 or 10 days. The progeny of one ounce of eggs—about 40,000 worms—will, on the average, consume the following weight of mulberry leaves during the 5 ages above described: First age, 9 to 11 pounds; second age, 25 to 30 pounds; third age, 80 to 110 pounds; fourth age, 275 to 350 pounds; fifth age, 1,590 to 1,720 pounds. Total for progeny of one ounce of eggs, 1,970 to 2,196 pounds of mulberry leaves.

Experience has shown that the above-given quantities of leaves can be gathered from 12 trees annually, or every second year from 24 trees, of white mulberry or its varieties grown in shrub form. The trees must be over five years old and in good health, and kept growing vigorously by cultivation and manure.

After each molt, the worms must be "rarified" and transferred to new trays in which they will have plenty of room to expand. Usually during fourth age

they are still further rarified once or twice during the age, and during the last age, in which they grow more than in entire previous life, the worms must be daily rarified, so that at all times they will have plenty of room and food.

In changing the worms into fresh trays, they must never be touched with fingers. By means of perforated-bottom trays and fresh food the worms are easily transferred. Some worms will refuse to pass up in to the fresh tray. These, if they are unusually small or inactive, should be thrown away as weaklings. If worms must be transferred by touch, use a fine camel's hair brush. Never squeeze the worms.

The trays with worms feeding are best kept on shelves bored full of holes, or what is still better, made of laths set on edge and nailed to cross pieces. This insures free circulation of air from below. The shelves, if placed one above the other, should be about 24 inches apart. The amount of space required by the progeny of one ounce of eggs is from 10 square feet during the first age; second age, 30 square feet; third age, 110 square feet; fourth age, 340 square feet; from fourth to spinning-up, about 640 square feet. If the worms are kept in trays of uniform size of 1 by 3 feet, the number of trays required at any time is found by dividing the number of square feet above given by 3.

To recapitulate: The requisites for a successful "education" of silk worms are, 1stly, eggs free from hereditary taint; 2dly, worms of uniform age and constitution; 3dly, plenty of mulberry leaves for food; 4thly, plenty of room to grow and expand; 5thly, plenty of fresh air and an agreeable temperature; 6thly, perfect cleanness.

Spinning the Cocoon.—About the sixth or eighth day of the last "age," the worms begin to show signs of restlessness, such as announced the previous molts. They shrink in size, cease to eat, and wander about throwing out silk threads. The brush for the worms to spin upon must now be prepared. These are dry twigs of oak or other trees free from odor and gum. The twigs should be copiously branched and about 18 inches long. Place them in bunches along the shelves on both sides, at intervals of 12 inches. Tie the interlacing branches so that the arches will not fall apart. If the worms have been reared in trays, place the trays under the arches. The worms will soon mount into the brush and begin to spin their cocoons. There are a few worms in every brood which refuse to mount into the brush. To accommodate these, remove the trays from beneath the arches and place over each tray a few of the brushy branches. These worms will spin their cocoons in the branches thus supplied. The temperature of the room must be kept at 80 degrees F. during the process of spinning, which usually lasts 3 days. It is very important that the temperature be 80 degrees F., neither less nor more. If lower, the silk does not flow freely in the worm's spinnerets. If higher, the worm is liable to premature exhaustion and may fail to complete the cocoon, or the silk will be light.

The worms which show no signs of wanting to spin, after general spinning has begun, should be fed sparingly until they do. But the trays are likely to soon become foul from the excrement of the worms which have already mounted. Cloths must be used to keep the trays clean at this stage. The worms in the brush must also be watched closely. If two or more are so close together that they are likely to spin compound cocoons, the worms must be

gently separated by aid of a soft camel's hair brush. Double cocoons are worthless for reeling. Such cocoons must be sold for waste silk, which is worth only one-quarter as much as reeled silk.

FIG. 5.—BRUSH FOR SPINNING THE COCOONS.

When the cocoon is completed—which requires about two days—the worm within casts its skin for the fifth and last time and takes on the form of *pupa* or *chrysalis*. In this condition it is surrounded by a hard, honey shell. The interior of the worm melts up and re-forms into the shape of the winged moth. The process of transformation requires 12 to 15 days. At the end of this period, if the chrysalides have not been killed or "choked," the winged moth pushes her way through one end of the cocoon. Such pierced cocoons are useless for reeling, but may be used for carding floss silk. They are worth about one-fifth the price of prime choked cocoons.

The cocoons for reeling should be gathered from the brush about 10 days after the first spinning began. The brush is carefully taken apart and the cocoons which are only lightly attached are separated from the branches with the fingers. They are at same time separated into grades according to color, size and firmness. The cocoons, especially those which lack firmness, must

be carefully handled, or the chrysalis within will be injured, will putrefy and stain the silk, which then has only the value of waste silk. After classifying the cocoons, the largest and firmest should be picked out for "seed" for next year. For each ounce of eggs, or "seed," that is wanted, 200 cocoons must be saved. The remainder of the cocoons are to be at once "choked" to kill the chrysalides. "Choking" is usually accomplished by putting the cocoons into a covered, perforated-bottom tin vessel like a kitchen colander and setting this for one-half hour over a kettle of vigorously-boiling water. A few chips of wood should be put into the kettle to prevent the bubbling water from spattering and staining the cocoons. Instead of steaming, the cocoons may be choked by putting them into an oven and heating to 140 degrees F. and for 8

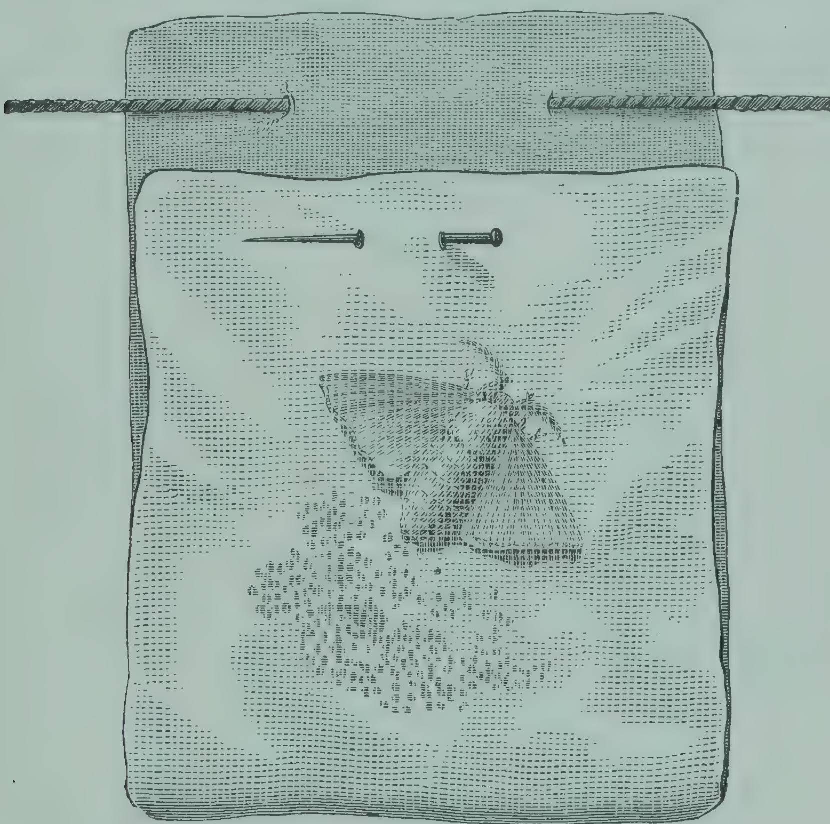


FIG. 6.—SILK-MOTH AND EGGS IN POCKET.

hours, or as long as a humming noise can be heard when the cocoon is placed to the ear. After "choking," the cocoons should be thinly spread on a sheet in the shade and allowed to dry out thoroughly. This takes several weeks. After the cocoons are dry, they will keep indefinitely, provided they are preserved from weevils and mice. It is usually best, however, to sell at once after choking. It is not desirable for any American silk grower to attempt to reel the silk at home. It is impossible, by the utmost skill even, to make as good a quality of silk by hand-reel as can be made by the improved automatic reel run by electric power. In communities where as much as 10,000 pounds of fresh cocoons are raised annually, it will pay to put up a co-operative reeling establishment. An improved automatic reel costs $50 to $80, not including motor or fittings. One reel or basin will produce 1 to 2 pounds of raw silk per day, and will, in 300 working days, consume about 14,000 pounds

of fresh or 1,200 pounds of choked cocoons. To produce 1 pound of raw silk requires 12 pounds of fresh or 4 pounds of choked cocoons.

The Production of Eggs.—The production of eggs for sale is, in all old silk regions a special branch of the industry, carried on by those who make a specialty of it—just as seedsmen grow seed for use of gardeners. But in all new countries each gardener and silk grower must, at first, produce his own seed.

We have already shown that for each ounce of "seed" 200 of the finest cocoons must be laid aside. These cocoons, at market price, are worth about 30 cents. The ounce of seed they will produce is worth, at market price, about $2.00. The selected cocoons are first with a needle and thread carefully strung into chains of 3 or 4 feet long. The thread should only pass through the loose, floss silk at one end of cocoon. Hang the cocoons from ceiling in a cool, dark room. The moths will emerge within 20 days from date of spinning first cocoon. They usually appear in early morning, and cluster upon the cocoons. Though they have wings, the moths never attempt to fly. They have no mouths, and, therefore, eat nothing. The sole end and aim of their existence is to produce and lay eggs. Then they die. Before the moths emerge, squares of clean cheese cloth about 3 by 3 inches are prepared—one-half as many squares as there are cocoons. Instead of squares, bags or pockets of cheese cloth 3 by 3 inches, with a flap of one inch at upper end, may be used, and are much better than the simple squares. The cloths should have been previously boiled in clean water for one-half hour and then dried, to kill chance spores of disease and remove from cloth gum or other substances which might injure the eggs. The moths will issue from 5 a. m. to 8 a. m. The two sexes are usually about equal, but it often happens that the male moths issue first. The sexes are easily distinguished by the slender body and longer antennæ or "feelers" of the male, and his greater agility. The female is larger and heavier, being gorged with eggs. The sexes couple in an hour after issuing and while still clinging to the cocoons. They are to be left so for about 6 hours. The room should be kept quite dark, but with plenty of fresh, moist air. Temperature about 80 degrees F. After 6 hours, place the prepared cloth squares or bags, turned inside out, and separated by about 2 inches, upon a flat table or shelf. Take up a couple of moths and separate them by gently pulling on the wings of the male, throw the male into a basket prepared for that purpose. Allow the female to rest for a few minutes on a clean board, or until she has ejected a quantity of reddish fluid. Then pick her up and place her upon one of the cloth squares or pockets. She will at once begin to lay her eggs, and will keep it up for about 36 hours, during which time she will have laid between 300 and 400 eggs. She dies soon after finishing, but must not be thrown away. Fold over her one corner of the cloth on which she laid her eggs, and pin her there. The body must be so kept until it has been examined with a microscope to determine whether or not she was free from the germs of the Pebrine disease. The moth is crushed in a mortar with a little distilled water, and a drop examined under a lens giving 400 diameters. If any moth shows evidence of this disease, the body and all the eggs she produced must be burned, as this disease is hereditary and contagious. Eggs produced by a diseased moth are worthless, as the

worms would not live through their complete life cycle, and would convey the disease to other worms of same "education."

It rarely happens that the cocoons set apart for egg production give out more females than males. When this occurs, after the sexes of those coupled have been together for two hours, they may be separated by gently pulling on wings, and the males may be used over again for virgin females. This is seldom necessary. After the eggs are deposited upon the cloths, they soon harden and become glued to the cloth. No further treatment is required, other than the microscopic examination of the mother insect. This work requires greater skill and more expensive appliances than the average silk grower possesses. It is usually best to send the cloth with eggs and mother attached to some scientific laboratory for examination. It is sufficient to send the moth alone, and if a number is placed upon the cloth and the same number attached to the moth, the eggs of any particular moth can be identified. But confusion is liable to arise by misplacing numbers. It is safer and better to keep the moth and her eggs together until the microscopic examination has been made. After the eggs are certified free from disease, they should be packed lightly, still on the cloths, in a ventilated tin case and hung from the ceiling of a cool, dry room. Rats, mice, ants and weevils are all very fond of silk-worm eggs.

We have already seen that the eggs can not be made to hatch until after 6 or 8 months. No particular care is needed as regards temperature, but the eggs must be kept dry and not be exposed to direct sunlight. Certified eggs of the best races are worth in the market \$2.00 to \$3.00 per ounce. For Southern silk growers the large white races of Italy are specially recommended.

Silk Gut.—Silk gut is an article of interest and use for rod and line fishermen. Gut is made from the same substance as raw silk, but in procuring gut the worm, just before it is ready to spin up, is killed by throwing it into strong vinegar or weak acetic acid for an hour or two. The silk spinnerets are then opened and the silk is forcibly drawn out into two threads very much thicker than that the worm naturally spins. These threads are steeped and hardened in cold water, and afterwards washed in a solution of castile soap. The threads are next manipulated and rubbed between the fingers until a thin epidermis peels off. The gut is finally dried in the shade. In some places the gut is bleached by sulphur fumes after drying. Each worm gives about 18 inches of thread from each spinneret. The threads are usually assorted and put up in bundles of 100. They are sold wholesale in dozen bundles at about \$2.25 per dozen. It requires about 18,000 of these threads to weigh one pound. The demand is pretty good. At present the supply comes almost wholly from Spain. When silk cocoons are low in price, more worms are utilized for gut than when silk is higher. About 2 per cent of all Spanish worms are now used for gut.

IV.—REELING THE SILK.

Reeling silk, or, in other words, unwinding the silk from the cocoons, combining several of the worms' threads into one compound thread and reeling this into skeins, is a process of manufacture which about doubles the value of the raw silk. Skill in reeling has become hereditary among the silk-growing peasantry of Italy and France, but modern automatic power reels can produce

a much better grade of silk from same cocoons than the most skilful hand-reeler. The hand-reel is now obsolete and can not be profitably employed in competition with power reels.

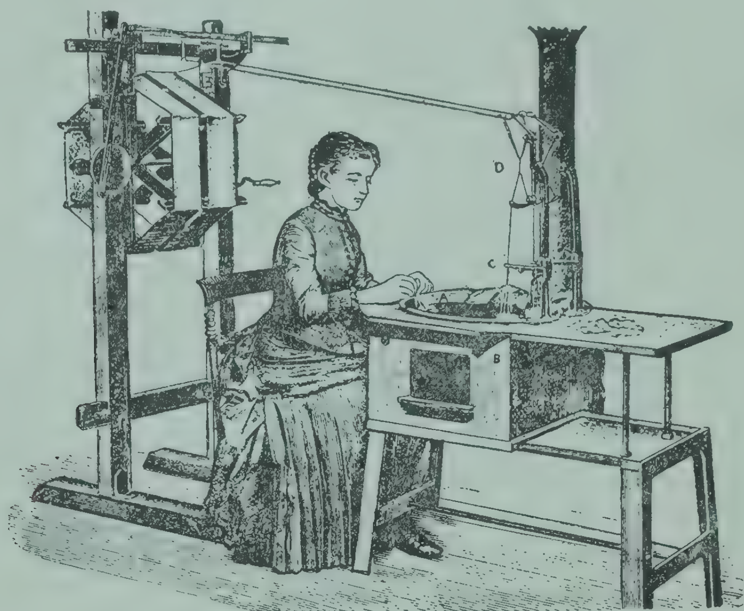


FIG. 7.—ITALIAN SILK REEL.

In forming the cocoon the worm works from within. It first throws out a loose, irregular covering which forms the "floss" of the cocoon. After this it proceeds in a more regular manner, laying down the silk in "figure-of-eight" loops. These are covered by a sort of gum which makes a continuous and very tough fabric from the different and separate strands of silk. To unwind this silk, the loose or floss silk is first torn off with the fingers. This silk is carded and spun in same way as wool. The tough inner part, called the "pod," is next thrown into a basin of water kept at a temperature of about 170 degrees F. Here it is beaten with a small whisk-broom until the gum softens and the silk thread shows signs of falling apart. One of these threads is caught on the brush of the broom and unwound until the outer end is found. Four or five similar threads are caught and passed through a glass or brass "eye" on the edge of the basin. The compound thread thus formed is twisted upon itself or upon another thread to get rid of surplus moisture. Some reels pass the thread through a heated box to further dry it before it is wound upon the drum. The length of the natural thread spun by the worm is about 4,000 yards. Its diameter is greatest in the center and tapers to both ends. In reeling the compound thread it is of prime importance to have the compound thread of uniform diameter throughout. To accomplish this, a fresh thread from the basin must be added from time to time to make up for the growing thinness of the other threads. This requires great judgment on the part of the reeler, but is accomplished automatically and with far greater precision by the improved reels.

The best reel is the Serrell, an American invention. Good reels are also made by Pozzi Bros., at Milan, and Pierino and Cecco, Udine, Italy. The American reel costs about $80.00, the Italian reel about $50.00. Prices in either case do not include power or fittings. With either of these reels, run

by steam or electric power, a woman with a girl to help can reel from one and a half to two pounds of raw silk per day. The following figures as to cost of reeling are given by a consul of the United States in Italy:

Wages of a woman reeling, per day	$0.55
Wages of girl brushing, per day	.15
Cost of fuel	.35
Rent of machine and room	.15
Interest on cost of cocoons	.20
Loss on cocoons	.08
Taxes, insurance, etc.	.10
Total cost of reeling 2.2 lbs. silk	$1.58
Less value of waste silk	.08
Net cost	$1.50
Cost per pound of raw silk	.72½

V.—DISEASES OF SILK WORMS.

The silk worm is subject to four grave diseases, which are described below. As the worms are reared under cover and with constant attention, they are not subject to the attacks of other animals, except mice and weevils.

I. PEBRINE.

Pebrine is a bacterial disease, which in years past has wrought enormous damage in the silk-growing regions of France and Italy. Thanks to the researches of Louis Pasteur, this disease is now easily prevented. Pebrine is hereditary, being transmitted to the eggs by the mother moth. To prevent the appearance of pebrine in a rearing-room, only eggs certified by a competent microscopist to be free from germs of pebrine should be incubated. If infected eggs are incubated, the worms will die before completing their last molt, and will in the meantime infect the healthy worms in same room. Pebrine is as contagious and destructive to silk worm as cholera is to human beings. When silk worms die during the rearing process from whatsoever cause, the dead worms should be removed and burnt, and the healthy worms removed to a fresh tray or clean shelf. No dosing or topical treatment for pebrine is of any value. The use of eggs infected by the germs of pebrine is the main cause of recent failures of silk growing in the United States.

II. MUSCARDINE.

Muscardine is a disease due to a parasitic fungus which attacks the worms. The same fungus attacks other insects, especially the house-fly. House-flies may transmit the disease to silk worms. Silk worms are more commonly attacked by muscardine during their last "age." The attacked worm dies suddenly and soon discolors and becomes stiff and hard. In about 24 hours thereafter the worm becomes covered with a whitish powder, which is the spores or "seed" of the fungus. These spores may be borne about by the air and so be carried to still healthy worms. The spores also are carried to the

walls of the room and upon the shelves, etc., used in rearing the worms. In such places the spores of the fungus retain their vitality for over a year. Unless the room and all woodwork is thoroughly cleaned and fumigated, these spores are certain to infect the new brood.

The only treatment for this disease is cleanness and thorough disinfection of the breeding-room before the worms are hatched. House-flies should be kept out of the breeding-room at all times. Dead worms, or even those sick, should be removed and destroyed as soon as observed. Beginners in silk growing must, however, be careful not to confuse the natural sickness of the worm preceding molting with muscardine or other contagious diseases.

III. GRASSERIE.

Grasserie, also called *Jaundice*, is generally present when the broods are large and where succulent food is used. Worms fed upon osage orange leaves are much more liable to this disease than those fed on mulberry. This disease is dangerous where the worms are kept in large numbers. The exact cause of the disease is not well understood, but it is believed to be due to bacteria acting upon the worm when its digestive apparatus is enfeebled by too succulent food. The only practicable treatment is to avoid wet and succulent food—feeding only leaves which have been picked and kept under cover for 12 or 14 hours. Observe the same precautions in regard to cleanness and destruction of diseased and dead worms as above recommended for pebrine.

IV. FLACHERIE.

Flacherie, also called *Pallor*, is now the most dangerous disease of the silk worm and one for which we know no remedy.

The symptoms of pallor are drowsiness and diarrhœa. The body first grows soft and flabby, shrinks and turns black. Sometimes the worms burst and give out a very offensive odor. Pallor is always worst when the worms are crowded, and when the trays and shelves are not kept scrupulously clean. A high temperature is also very conducive to this disease. The only practicable treatment is that advised for the other diseases—scrupulous cleanness, plenty of fresh air, good but not too succulent food, and the early hatching of the worms so as to insure their spinning-up before hot weather comes on.

VI.—General Rules for Silk Growing.

1. Incubate only eggs certified to be free from pebrine.
2. Clean and fumigate the incubating and rearing-rooms before the eggs or worms are placed therein.
3. Practice the most scrupulous cleanness and attention to feeding and ventilation during the entire rearing period.
4. Discard all eggs which remain unhatched after three days from time the first eggs of same brood hatched.
5. Cut or hash the leaves for the first five days after the worms have hatched.
6. Never feed dirty, wet, cold or diseased leaves. Pick the leaves 12 hours before they are to be fed, and cover them with a clean sheet. Do not keep

the leaves in same room with the worms. After the first few days the individual leaves may be picked or fed on the twigs bearing them.

7. Feed the worms in perforated, cloth-bottomed trays or on lathed shelves covered with smooth paper, also perforated. Trays are best.

8. Change the trays or papers for clean ones as often as they become soiled. Throw away all sick worms every time the litter is changed. This does not refer to the sickness which precedes molting.

9. Separate and "rarify" the worms as often as they become crowded. Give plenty of space to expand in.

10. Never place together worms from different lots of eggs, or worms which have hatched on different days.

11. Never disturb worms while they are molting.

12. Prepare for spinning the cocoons an ample supply of dry, clean, odorless and gumless twigs.

13. Form the arches with these twigs over the shelves or trays as soon as the worms show signs of wanting to spin, which is usually about the eighth day of the last "age."

14. Remove the cocoons from the twigs on the tenth day from first spinning-up.

15. Assort the cocoons carefully according to size, color and firmness.

16. "Choke" the cocoons for reeling within 24 hours after removal from the twigs. Choking is best done by live steam.

17. If cocoons are selected for "seed," take the finest ones. String them on threads and hang in a dark room. For one ounce of seed, take 200 cocoons.

18. Cause the moth to deposit on squares or pockets of cheese cloth 3 by 3 inches.

19. Keep the moth and eggs together until the moth has been examined by a microscopist for germs of pebrine.

20. Never buy or sell any but certified disease-free silk worm eggs.

VII.—THE FUTURE OF SILK GROWING IN THE UNITED STATES.

In Chapter I of this *Bulletin* it has been shown that silk growing was, in the early years of the last century, a very considerable and profitable industry in the United States. More recently, from about 1880 to 1890, considerable raw silk was produced in North Carolina, Ohio, Illinois, Kansas and California, under the encouragement of Congress and the Ladies' Silk Growing Association of Philadelphia. These efforts ceased soon after 1890, chiefly because of unfair tariff discrimination against native raw silk, and because of the lack of skill and care among growers, which permitted two very destructive diseases, pebrine and flacherie, to obtain a foothold.

Silk growing always has been and always will remain a species of household labor, especially desirable as a source of income for the younger and aged members of the family. It can not be carried on as an extensive enterprise, but must remain a household industry, for labor which would otherwise be unproductive. Silk growing is also a very desirable branch of work for orphan asylums and similar institutions. A little earnest work in this line will add millions of dollars to the wealth of the State, and at the same time increase the comforts and enjoyments of country life.

In any economical enterprise the question of labor is the fundamental one.

Experience has shown that for lack of suitable labor, silk growing is not successful in new and sparsely settled communities, and in localities where for any reason the wages of light agricultural labor are higher than the world's average.

In practical silk growing, at least eight-tenths of the entire labor is done by women and children of the family—whom our social customs will not permit to do ordinary field labor—and by men too old or too feeble to do even the lighter kind of field work. Such labor as this has at present little or no commercial value. The establishment of silk-growing industry in North Carolina and other States means the utilization of this labor now unproductive. It will mean the addition to many families of an increased income of from $60 to $200 per year without much outlay for material or any hardship to the workers. The work of tending silk worms is easy, clean and pleasant. It is work that children and women of culture and refinement delight in. By raising from 2 ounces of eggs two broods of silk worms annually, a child of twelve or fourten years may, in ten weeks in early spring, earn money enough to purchase clothing and school books for the entire year, or the means of taking a summer vacation and travel. There are at least 50,000 families in North Carolina which may each year rear the product of four or five ounces of silk worm eggs, and this without interfering with the regular work of the household. The additional income thus produced would amount for the entire State to over $3,000,000. This large sum being produced by the labor of the ordinarily non-productive members of the family, would naturally go for purchasing increased comforts and luxuries for these. It would add just so much to the prosperity and enjoyments of country life.

We have seen that the reeling of the raw silk about doubles its value; therefore, if the $3,000,000 worth of silk worm cocoons which the State may produce are reeled within the State, it will double the State's income from this source, although silk reeling is fit labor for otherwise productive men and women. Silk reeling can not be economically done at home.

The removal of the unjust tariff discrimination which now favors foreign silk producers at the expense of the American industry, is so necessary and so openly required by public policy, that it does not seem how Congress can long refuse to act. Silk culture in America is emphatically an "infant industry." It needs the encouragement and protection always given infants and such as is now given to silk weaving. At present, completely manufactured silk, that is, silk cloth, ribbons, etc., imported from abroad pay an *ad volorem* duty of 54 per cent, whereas, the so-called "raw" or reeled silk, which is in truth partly manufactured silk, pays no duty at all. The most improved machinery for reeling silk is of American invention. By means of the automatic reel one person not specially skilled can reel more than twice as much silk in a day as the most experienced hand-reeler can do, and at the same time produce a thread of even fineness throughout, making it of much higher grade than any hand-reeled thread. A duty of 25 per cent *ad valorem* on reeled silk, while affording reasonable protection to American silk manufacturers, will enable American silk growers to supply the home market and save the greater part of the forty-five millions of dollars per year now sent abroad for reeled silk.

Though the most improved silk reel is of American invention, these reels are not used in America. The inventor was driven by an unjust tariff to seek a market for his invention in European silk-growing countries. The American silk grower has now to compete with silk produced abroad and partly manufactured there by American machines, while the tariff prevents him from enjoying the benefit of this machinery himself.

Ten years experience in the United States, from 1880 to 1890, has shown that the silk worm and its food plants are hardy over the entire length and breadth of the country, and that a first-class quality of silk can be produced everywhere. The regions that seem specially adapted for silk growing are California on the west coast, and on the east coast the region from Connecticut on the North to Florida on the South.

In the silk-growing districts of Southern France, which adjoin the chief silk-growing region of Italy, the following scale of wages are quoted in a recent Consular Report of the United States Department of State: Male laborers per day, 55 cents to 60 cents; male laborers per week, $3.30 to $3.60; male laborers per month, with board and lodging, $7.00 to $9.00. Female laborers receive about one-half these wages. The above figures are for ordinary farm labor only. For skilled labor, such as grafting vines, men get 80 cents to $1.00 per day. An ordinary day's work does not exceed seven hours. A day's work is nominally twelve hours, but laborers are allowed three rests of one and one-half hours each. Even then the laborer works with the placid deliberation of a man working against time. Their tools are rude and awkward. On small farms the preparation of the ground and entire cultivation is done with a heavy hand-hoe.

The same report quotes for ordinary farm labor in the silk-growing districts of Spain the following wages: Men, 40 cents to 50 cents per day; in harvest, 70 cents to $1.00.

In Spain women are employed only at light work, such as gathering grapes, for which they receive about 15 cents per day. A day's work is 9 hours.

The report of the North Carolina Commissioner of Labor of 1889 quotes the following wages for farm labor:

Men, per day, 50 cents; per month, $8.90, with rations and house equivalent to about $6.30. Women, per month, without rations, $5.27. Children, per month, without rations, $3.58.

Farm wages in North Carolina, compared with those abroad, are not higher than in Italy or Spain for the same class of work. Considering the greater cheapness of food, lower taxes and freedom from military service in America, even were American wages higher than they are, the more general use of labor-saving tools and our more intelligent labor will enable us to compete with similar labor anywhere.

SILK-WORM FEEDING CHART, CALCULATED FOR PRODUCE OF ONE OUNCE OF EGGS.

Ages.		Approximate Quantity of Mulberry Leaves Needed.		Space Required in Trays.	Optimum Temperature of Rearing Room.	Remarks.
FIRST AGE.	1st day	1½ lbs.	Total, 10 lbs.	10 square feet.	73 degrees F.	During this age give four meals each day progressively increased. Tender young leaves chopped fine. Feed at 6 a. m., 10 a. m., 2 p. m., 6 p. m. The worms molt on 5th day. Rarify as soon as recovered from molt. Give about 3 times as much space as before. Keep the air in room pure and dry, and the temperature uniform. Avoid drafts and noise.
	2d day	1½ lbs.				
	3d day	4 lbs.				
	4th day	1½ lbs.				
	5th day	1½ lbs.				
SEC'ND AGE.	1st day	6 lbs.	Total, 30 lbs.	30 square feet.	75 degrees F.	During this age give four meals each day. Use tender leaves, not chopped. Worms molt on 4th day. Rarify as soon as recovered from molt. Give about 3 times last space. Keep the air in room pure and dry, and the temperature uniform. Avoid drafts and noise.
	2d day	8 lbs.				
	3d day	10 lbs.				
	4th day	6 lbs.				
THIRD AGE.	1st day	8 lbs.	Total, 110 lbs.	90 square feet.	76 degrees F.	During this age feed as before, only increasing quantity. Worms molt on 5th or 6th day. Rarify again. Give 3 times last space. Keep the air in room pure and dry, and the temperature uniform. Avoid drafts and noise.
	2d day	26 lbs.				
	3d day	30 lbs.				
	4th day	30 lbs.				
	5th day	8 lbs.				
	6th day	8 lbs.				
FOURTH AGE.	1st day	30 lbs.	Total, 340 lbs.	270 square feet.	78 degrees F.	Feed as before but give mature leaves, unchopped. Worms molt on 6th or 7th day. Rarify as soon as recovered from molt, and give 3 times last space. Keep the air in room pure and dry, and the temperature uniform. Avoid drafts and noise.
	2d day	40 lbs.				
	3d day	60 lbs.				
	4th day	70 lbs.				
	5th day	70 lbs.				
	6th day	40 lbs.				
	7th day	30 lbs.				
FIFTH AGE.	1st day	60 lbs.	Total, 1,900 lbs.	810 square feet.	80 degrees F.	Feed four meals daily for first four days. 6 or 8 meals for 5th, 6th and 7th days. Four meals daily for remainder of this age. Worms show signs of spinning on 8th day. Prepare and place the brush on 9th day. Feed sparingly on 10th day. Preserve perfect quietness during spinning of cocoons.
	2d day	90 lbs.				
	3d day	150 lbs.				
	4th day	200 lbs.				
	5th day	300 lbs.				
	6th day	380 lbs.				
	7th day	380 lbs.				
	8th day	200 lbs.				
	9th day	100 lbs.				
	10th day	40 lbs.				

Remove cocoons from brush on 10th day after spinning began. Select those wanted for seed, and immediately choke others by steam or dry heat. String the seed cocoons and keep in a dark room at about 70 degrees F. Make necessary arrangements for egg laying

GERALD MCCARTHY, *Biologist.*

DEHORNING BEEF CATTLE.

One has but to travel through the sections of country from which beef cattle come to be impressed with the fact that dehorning has passed the experimental stage and is largely practiced by those who are raising steers to be sold to others to feed. The advantages of the custom are so many and so great that the simple naming of them ought to convince the most skeptical that to dehorn is the humane and proper thing to do.

Among the advantages of dehorning, writes the Live Stock Market Report, may be mentioned the saving of space at feeding bunk, hay-rack, shed, watering-tank, or wherever cattle congregate; less danger of injury in shipping; a more uniform appearance, and the fact that, other things being equal, horns detract 10 to 15 cents per 100 pounds from the selling price of cattle. This is especially true where they are intended for further shipment alive; in fact, some of the eastern shippers have instructions not to buy horned cattle if they can possibly fill their orders with dehorned animals of the required weight and grade.

We believe that it is to the interest of every man who raises or feeds cattle to dehorn them, and the younger it is done the better.

There still remain a few persons so finely constructed that they shrink from the thought of inflicting pain, and for that reason oppose dehorning. Such people should watch the cattle unloaded at the stock yards, note those with eyes gouged out, horns broken and bleeding, and bodies bruised by horn-thrusts; and then go home and resolve to dehorn.—*Ex.*

THE FARMER BOY.

At a recent meeting of the National Live Stock Exchange, held in St. Joseph, Mo., President Thompson delivered an address from which the following is taken:

"It is an acknowledged fact that the welfare of our Nation, our government, our churches, banks, schools, railroad interests, commercial relations, interstate and international, depend largely upon the success of our unlimited agricultural resources. I say the agricultural resources are unlimited, if only husbanded upon economical principles. This being true, and as this is the greatest industry of our country, why should it not receive the greatest attention and most thorough study? Why should farming not be a profession handed down from one generation to the next, and thus constantly be improved? Should not the farmers' sons, as well as other young men, follow agriculture as a profession? They, by right of birth and rearing, should be the agriculturists of the next generation.

At present you will find farmers' sons in all branches of industry. Many of them will say: "Sorry is the day I left the old farm." In former days the boy of the farm had a hard life; toiled early and late, with but few hours free from labor wherein he could cultivate a taste for knowledge. And when once interested his chances were so meagre he could scarcely satisfy the desire to learn more about his chosen profession.

"The surroundings of the farmer's boy have now changed. His work has been lightened by labor-saving machinery. The marvelous system of news-

papers, those great educators of the people, bring him wisdom and information from all parts of the world and place them at his disposal wherever he is, from rugged Maine to barren Arizona.

"The people of the whole country show their interest in him by liberal appropriations of money through legislatures for more and larger agricultural schools, where it will be possible for him to become more familiar with his chosen profession. Besides this, our Nation highly honors his calling. The agriculturist is to be found connected with all our leading industries. They are in the majority in our legislative bodies, and, of a truth, upon them we depend for laws to protect our institutions, and such laws are felt through the entire system of our government. The farmer is an important factor in our national life. All encouragement should be given to the son to follow in his father's footsteps."

COTTON-ROOT BARK.

By GERALD McCARTHY, Botanist.

There is a considerable demand for cotton-root bark for use in manufacturing medicines. The bark may be gathered after the lint is all picked, so that the price received from sale of bark is clear profit.

To prepare cotton-root bark for medicinal use, the stalks should be pulled out of the ground before hard frost. Wash them clean, and with a shoe knife, or any convenient instrument, strip the bark of the root from the wood. Let the bark be taken off as nearly whole as possible. Make an incision through bark around the stalk at point where surface of the ground touched stalk, and take only the part below this. Stem bark is of no value, and chemists will not buy it. The root bark, after removal from the wood, must be dried under cover. It is then ready for market.

Chemists and brokers in herbs buy dry cotton-root bark in quantities of 500 pounds and over. The demand is quite good, and cotton growers can make some money out of the stalks, while at same time ridding the ground of an encumbrance. The price at present date is 3 cents per pound. Anyone who has the bark for sale should send a small sample, one-half pound or so, by mail to anyone or more of the following firms, all of which are purchasers of this article: Sharpe & Dhome, Baltimore, Md.; Muth Bros. & Co., Baltimore, Md.; Davis & Davis, Baltimore, Md.; Higgins & Waters, Baltimore, Md.; Parke, Davis & Co., Detroit, Mich.; Frederick Stearnes & Co., Detroit, Mich.

COTTON BLIGHT.

By GERALD McCARTHY, Botanist.

"Cotton Blight," a disease of cotton roots, is increasing yearly on the sandy soils of the southeastern counties of the State. This disease can not be cured by any chemical spray or powder. It must be controlled by hygienic or preventive measures.

The stalks and roots from diseased areas should be carefully pulled as soon

as possible after the last picking of lint. Burn them on the ground. Then plow and plant the field in some hardy crop, such as wheat, oats, rye, Canada pea or Scotch vetch.

Do not plant cotton on that field again for three or four years. Do not plant watermelons or other cucurbitaceous plants nor cow peas. All these crops seem liable to infection by the cotton root disease or "Blight."

The Jackson Limbless variety seems more resistant to the Blight disease than any other variety suitable for upland culture.

If a field has become badly and generally infected with the fungus causing Cotton Blight, probably the best and safest plan is to seed it down to Bermuda grass and Sand vetch, and use it as a pasture for cattle, horses or hogs. A good pasture of this kind can be made to carry 10 hogs to the acre for nine months of the year, or until the hogs weigh 200 pounds each. Such pasture-grown hogs will make the very best bacon, and will bring the highest market price. Bermuda grass roots can commonly be had for the gathering. To secure a stand plow out a shallow furrow in each middle, strew the roots a few inches apart in the drill and cover three or four inches deep.

The vetch seed may be strewn in same furrows before covering in, or they may be sown broadcast and harrowed in after the stalks are removed. Once established the vetch will seed itself and hold the ground from year to year. The vetch makes its chief growth from October 1st to June 1st. The Bermuda from June 1st to October 1st. The two together make a fine all--the-year-round pasture, and one that never fails, either from drought or cold,

Instead of Bermuda grass one may sow crimson clover or Jerusalem artichokes and vetch precisely as advised above. The Jerusalem artichoke makes a fine food for hogs, but is of no value for other stock.

THE NECESSITY OF LIVE STOCK ON THE FARM.

BY PROF. CHARLES W. BURKETT.

From earliest time man has been associated with the flocks and herds of the pastures and the fields. He passed from his nomadic and pastoral environments into one of residence and permanence. He had his flocks and herds always with him. But in recent time, in our part of the country, cotton became king and live stock was sacrificed to our loss and peril. Commercial fertilizers were wedded to king cotton, and the land these two have ruled so long has become devastated with a most deadly disease that is leaving the land dead and unproductive. The only hope is in restoring live stock to the place it rightly belongs, when wealth, prosperity and plenty will come to us again.

WHAT LIVE STOCK MEANS TO OUR PEOPLE.

The farming class is deserving many comforts and luxuries. Nothing will bring them more than the domestic animals of the farm. All kinds of domestic fowls should abound to furnish meat and eggs for all occasions. Cows should be kept in an abundance to supply all butter and milk needed

in the farm home and have to spare to supply an exchange for many little things of the town.

SPECIALIZATION IN LIVE STOCK.

One is surprised when he discovers the large quantities of butter, cheese, hams, mutton and beef that come into our State annually to feed our people. There might be an excuse for this state of affairs if people in other States could supply these food stuffs cheaper than we can ourselves. But it can be done in no place. Ours is an especially well-favored State. We can grow all crops, in quantities unequalled elsewhere. A soil naturally fertile and a climate adapted for maximum crops.

We should not only supply all of the foods mentioned above, but should supply many markets elsewhere, because we can produce butter and beef and mutton at a greater profit than in those sections supplying them now but not so well adapted, either by soil or climate, to do so.

LIVE STOCK AND SOIL FERTILIZING.

The great necessity of live stock with our people, as with all peoples, is to maintain the fertility of the soil. Taking off crops year after year depletes the soil. It wouldn't be so bad if we grew cotton and returned the rich fertility in the seed back to the soil from which it was taken. But we do otherwise; we ship this fertility out of our State to other States, where it is fed to dairy cattle and to beef cattle, in the end building up other people's soils, but depleting our own. And then we buy back again the products of live stock grown elsewhere. We send to Wisconsin, or Ohio, or Minnesota our cotton-seed meal, each ton having from $15 to $20 worth of plant food, for them to make butter for us, which contains forty-eight cents worth of plant food. Do you wonder agriculture loses its charms for our boys when we have sold the birthright rightly belonging to them?

Necessity forces us to combine live-stock husbandry with grain and cotton production, so as not only to produce the grain and forage crops of the farms, but to feed these same grains, or many of them, and the forage crops, to produce meat and wool and milk and butter.

Where a farmer does this he gets a profit on the market value above cost of production; but it goes further than that—he gets another profit in the gain in quality as well as the gain in weight, because he is manufacturing these from raw materials into finished products. In this sense, the farmer is both a producer and middleman; he gets both profits.

Live stock on the farms means building up the soil and increasing its productive powers. In fattening animals, the experiments of Lawes and Gilbert show conclusively that more than nine pounds out of every ten of the essential fertilizing ingredients of the food reappear in the solid and liquid excrement. A Flemish proverb reads: "No grass, no cattle; no cattle, no manure; no manure, no crops."

For a prosperous agriculture, then, we must have live stock; this means more comforts in every way; more profits, because the farmer is a producer, a middleman and a manufacturer; more wealth and increased valuation, because the soil is being built up and improved by the organic matter and plant food added to the soil. Live stock is, therefore, our necessity.

THE AGRICULTURAL AND HORTICULTURAL CAPABILITIES OF NORTH CAROLINA.

BY PROF. W. F. MASSEY.

The admirable speech of Dr. Winston, published in the last number of *The Bulletin*, very properly speaks of the great importance of agriculture to a State, and of a more correct system of farming. But Dr. Winston seems to be impressed with the idea that the lands of North Carolina are too poor for the farmers to compete on fair terms with those of States north of us. The State of Massachusetts, as he says, is far ahead of us in technical education, and yet in Massachusetts there are hundreds of farms with good buildings which have been abandoned by the owners because they could no longer make a living on them, and the people of Massachusetts are largely fed by other States, North Carolina included. No farms have been abandoned in North Carolina, though it is true that many are poorly cultivated, and there is a sad lack of knowledge in regard to profitable and practical farming. There are few States with greater agricultural possibilities than North Carolina, no State where there is a greater variety of soils and climates, which indicate a great variety of products. In the eastern section, the gardeners are supplying the entire demand of the Northern and the English markets for tuberose bulbs, and are branching out into other lines of floriculture. They are competing in winter with the Northern hothouses in the culture of lettuce, and doing it far more profitably than the Northern growers are. In the general production of vegetable crops for the early market, they are competing with all the rest of the country, and doing it well. A State in which the growers can raise a crop of early potatoes that averages three times as large as that of the great State of New York, and can get a crop of peavine hay from the same land, and then grow from 150 to 200 bushels of potatoes in the late fall on the same land, is in a position to compete on very favorable terms with the States north of us, where it takes the whole season to grow the one crop of potatoes. The average crop of potatoes in New York is put down at about 90 bushels per acre. The trucker in Eastern North Carolina who grew no more than that would think he had a dead failure. Only yesterday I received a letter from a farmer in Columbus County, who says that his crop of late potatoes, grown from seed of the early crop, was over 160 bushels per acre of potatoes averaging the size of a goose egg. When farmers can dig crops like that late in November, it is evident that we can compete on very favorable terms in the production of winter potatoes with States north, which take the whole season to average 90 bushels on land worth ten times the price that it can be had for here. Last year Mr. Dawson, of Edgecombe, made 1,500 barrels of this second-crop potatoes at the rate of 65 barrels per acre, and sold them before Christmas for $2.50 per barrel, and had the land set in cabbages in November. These crops are grown between the 20th of August and November, after the same land had produced other large crops. Where is the State north of us that can compete with such things?

A letter a short time ago from a large tobacco grower in Ohio stated that he

was getting for wrappers there six to seven cents per pound, and that was the top of the market. His land is worth ten times what most of the tobacco land in North Carolina is worth, and his labor cost twice as much. North Carolina tobacco has sold as high as 85 cents per pound this fall, and the general average is far higher than that for wrappers in Ohio. A few years ago, before the tobacco business became depressed as it has been since, I saw the crop of two acres of land sold at public sale for $996.50, and I was told that the land on which it grew did not cost $10 an acre. There is not a State north of us which would not be in a far worse condition than North Carolina had the land been treated as badly as it has been here. The census reports show that the average yield of hay in North Carolina is a third larger than the average yield of hay in New York State, and that the average value of hay per acre in North Carolina is larger than the average value of the cotton crop. Over fifty years ago the late Edmund Ruffin wrote a book on Eastern North Carolina, in which he stated that it was destined to be the greatest stock country on the Atlantic coast, because of the wonderful profusion of native grasses. From that day down, the farmers of that part of the State have been trying to kill the grass to grow cotton, when the grass, with stock, would have kept their lands rich and made them richer than the cotton has. Then, too, over the great central slope of the rolling uplands, from the coast-plain to the Blue Ridge, North Carolina has a vast body of land capable of the highest production in grains and grasses and stock. As I have often remarked, our red-clay uplands are all good soil down to the fast rock, and absolutely inexhaustible with any fair system of farming. Right under the scratching of the little plows that have been used to stir the surface and let it wash away to the bottoms, there lies an unexhausted soil, waiting, on every poor farm, for some one with pluck enough to drive a big plow into it. The experiences of those who have cultivated the red uplands intelligently proves their value. The late Governor Holt made over forty-six bushels of wheat per acre on an eighty-acre field, and even in the eastern section, only last year, Mr. Daughtridge, of Edgecombe, made over thirty bushels of wheat, sown after cotton, and without fertilizers, the middle of December. Where is there a State north of us where such things can be done? The farm adjoining Cornell University in New York made eight bushels of wheat per acre, according to Professor Roberts. The value of the uplands of the State is well shown by the crops produced on the college farm, where 88 bushels per acre have been grown of corn on the hills. The prize crop of the great State of Illinois was something over 60 bushels per acre last year. There is not an old red hill in all the Piedmont country of North Carolina which can not, by intelligent culture, be made to produce from 75 to 100 bushels of corn per acre, and pay a profit in its improvement. Up in Lincoln County there are several farmers who have for years been corresponding with me, and have been farming in a systematic way according to the suggestions I have made. One of these wrote that his crop of winter oats was 75 bushels per acre, and that he cut 2 tons per acre of cowpea hay from the same land after the oats were harvested. Another man in the same county writes this present week that he has gotten his farm to average 40 bushels of corn and 25 bushels of wheat, and gets plenty of hay to feed cattle and make manure. Then, too, beyond the Blue Ridge the people are realizing the capacity of their lands for special crops, and on the high plateau

of Henderson County they have developed a business in the growing of late cabbages for the Southern market, and are shipping many thousands of dollars worth to Florida and other Southern coast points, where this late crop can not be grown. We have the finest apple region in America in our western mountains, and when transportation facilities are as good as elsewhere, they will be on the market. But at present, when the merchant in Raleigh can get a barrel of apples from Boston cheaper than he can get them from the mountains, he will get the Boston apples, of course. With proper transportation facilities there will grow up a great trade in the apples and other fruits of the North Carolina mountains.

There are to-day wider opportunities for usefulness and independent life on the farms for our young men than in any other line of effort. Of the hundreds who are pushing into the study of mechanics, engineering and textile industries, a few are doubtless seeking their proper life work; but there will be a large percentage of these who will finally be compelled to drift back to the farms for a living, without the education they should have had for their life-work. We can hardly blame the young men, for they have seen no good farming done at home, and have not realized what there is in the soil for them; and when they take for granted that their State is too poor to compete with other States in agricultural productions, there is little encouragement for the young men of capacity to enter into the study of agriculture as a profession. The negro is the agricultural laborer of the South, and we need educated brains to direct him. Well directed, he is as good a farm laborer as any, if given fair wages and paid promptly. The aim of the education of the farm student should not be to merely develop skilled farm laborers, but to develop brain power to direct the labor of which we already have plenty. The mere acquirement of manual skill on the farm is a poor thing for a college to undertake. There is no need of a college for this; but there is for the educating of men who are to be the leaders in agricultural development and directors of the labor already on the farms. The curse of the agriculture of the State to-day is the tenant system. No business on earth, except farming, could stand the percentages the croppers have to pay to be carried through a season, and it is great testimony to the inherent fertility of the soil of North Carolina that it produces anything under such a skinning system. What we need is some men of means who *have faith in the soil of the State*, and are willing to invest in real farming in North Carolina. Poor as the farming is to-day, where is there a business that pays better for the capital invested than farming? A man with a farm that would not sell for $5,000, will raise a large family in comfort and independence. Where else could he invest the money any better? I know of one man in this State who has raised a family of nine, has educated his children and lived comfortably on 36 acres of land. Is there any place North that can compete with that? This gentleman told me that he had proved that it only takes 4 acres of North Carolina soil to raise and educate a boy, and his land was far from being the best in the State naturally. The hope of the State is in her young men, and the education that is to save the young men to the State is an education for the farm. Let those who are especially fitted for other pursuits follow their natural bent, but do not try to mould every man into the straight-jacket of the shop and factory, and send him wandering over creation for a job after the State has educated him.

THE CROP-PEST COMMISSION.

BY FRANKLIN SHERMAN, JR., ENTOMOLOGIST.

In connection with the exposure of the Amos Owens cherry-tree fraud, many persons probably heard of the Crop-Pest Commission who were not aware of its existence before. We therefore give a sketch of the work of the Commission.

The North Carolina Commission for Controlling Crop Pests was created by an act of the Legislature of 1897, and the Commissioner of Agriculture, Director of the State Experiment Station, and the President of the State Horticultural Society, compose the Commission. At present these men are Messrs. S. L. Patterson, Chairman, B. W. Kilgore and J. Van Lindley, respectively. The Entomologist is not a member of the Commission, but is their agent and representative, who does the active field-work of inspections, etc.

The Department of Agriculture aids the Crop-Pest Commission in meeting the expenses that it is obliged to incur in its work. Perhaps readers of *The Bulletin* will be surprised to know that, in the crop-pest work as carried on by the Commission and the Department, about 5,000 miles have been travelled in the year 1901, and nearly a thousand letters have been written regarding the insects and diseases that attack crops of various kinds. Over one hundred and twenty complaints of insect injury have been received, and in every case the best and most practicable suggestion known to us have been promptly given. This very article will be read by a considerable number with whom we have had correspondence on these subjects.

We wish to announce that every farmer should be quick to inform us of outbreaks of injurious insects, so that he may be informed as quickly as possible what to do. Such inquiries should ALWAYS be accompanied by specimens of the insect. It does no good to say that your apple trees are "attacked by a little black bug," because it may be any one of a dozen kinds of "little black bugs," or, it may be that the little bug you are thinking of is not the guilty party.

During this winter, if you are a good orchardist, you will cut out the dead limbs from your fruit trees, and will also shape the tree up so as to admit the light into the body of the tree. When you are engaged in this work, keep a sharp watch for insects, and eggs of insects, and if you desire information regarding some that you find, put them in a little tin tobacco box and send them to the writer of this article, stating where they were found. We are here for the purpose of giving you this information. You send no money "in advance," and there is no "endless-chain," get-rich-quick plan about this.

We know of no remedy for any insect that does not require labor or cost to apply it. Some people seem to think that we ought to furnish them with some magic remedy—a sort of cure-all for every insect pest. We know of none such.

But send us specimens when you find any you wish to know about. We don't know *everything* about *all* the bugs in creation, but will perhaps be able to enlighten you regarding any that are injurious or likely to become so.

THE AMOS OWENS CHERRY-TREE COMPANY.

BY FRANKLIN SHERMAN, JR., ENTOMOLOGIST.

No doubt many of the readers of *The Bulletin* have heard of this concern, which began its career under the above name during the past autumn. As the nursery certificate of the North Carolina Crop-Pest Commission was used as a shield to its practices, we feel that an explanation is due to those interested.

The certificate which was used by the company was given on the 6th of September, to a private individual, with the understanding that it was to cover only Amos Owens' cherry trees, which were to come from Cherry Mountain, in Rutherford County. After the certificate had been given, the "company" was formed and began its "endless-chain" work among its agents. Soon a number of inquiries were received at this office asking about the individual to whom the certificate was issued, and also about the company's reliability. It soon became evident that something was wrong, and the writer was detailed by the Crop-Pest Commission to go to Rutherford County and make an investigation.

Without going into details, it is enough to say that the trees, method of business, and general conduct of the company were found to be fraudulent. Trees that had been hauled from Mitchell County were sent out under the label "Amos Owen Cherry Trees," and further, it was found that in several instances agents who had apparently worked faithfully for the "company" were not able to collect their pay.

It seems strange that persons, and sensible persons at that, should be so quick to fall into the hands of such "companies," especially when they are first obliged to send in money to the extent of several dollars before starting work. Furthermore, we are informed on good authority that these endless-chain schemes are illegal, and persons should therefore be doubly careful.

From what has appeared in the newspapers, we take it that there are at least two other endless-chain concerns now working in this State. One is a Balsam Cane Company, with headquarters at Whittier or Sylva, and the other is a Stereoptican View Company, with offices at the other of the two places just named. We are also told that there is a Florida newspaper now being run on the same plan.

While we are considering this subject, it is but justice to say that Amos Owens himself, the famous old blockader, has had no connection with the "company" which used his name. The use of his name was of itself a fraud which is not a slight offense. "Uncle" Amos told the writer that he considered the "company" to be a fraud, and that he would like to see it put out of business.

Let us hope that the readers of *The Bulletin* were not deceived by the Amos Owens Company. In the October *Bulletin* you will find a list of all the parties in this State who can do a legal business in selling and shipping trees. If you will strike out the name of Frank Bright, of Henrietta, the list will be up-to-date.

PROCEEDINGS OF THE BOARD OF AGRICULTURE.

The Board of Agriculture met in semi-annual session in the Department Building, on Tuesday, December 3d, and remained in session until the Friday following.

Much of the business transacted was of routine character, such as hearing read the reports of the various officials, auditing accounts, discussing plans for new college buildings, etc.

Doubtless the matters of most public interest were the resolutions requiring the branding and taxing of cotton-seed meal, when sold as a fertilizer; the legislation concerning the cattle quarantine line in the west; and action taken in regard to rebuilding Watauga Hall, at the Agricultural and Mechanical College, recently destroyed by fire, and the erection of a new building for chapel and dining-room.

INSPECTION AND ANALYSIS OF COTTON-SEED MEAL FOR FEED AND FERTILIZER.

Some misapprehension seems to exist as to the purpose of the Board in requiring cotton-seed meal when sold as fertilizer to be treated as other fertilizers are treated. This action was taken after a thorough consideration of the matter, and in response to the representations from a considerable number of the manufacturers of cotton-seed meal and a large number of the consumers of it to the effect that meal is being and has been for some time in the past largely adulterated with cotton-seed hulls, and perhaps otherwise. The object of the Board was to prevent adulteration of meal, and to protect farmers and other users of it, as is done with regard to other fertilizers and fertilizer materials. Good cotton-seed meal will analyze at least 8 per cent of ammonia, and the value of the meal is dependent almost entirely on its contents of ammonia. During the present season cotton-seed meal has sold for from $24 to $26 per ton. If it should be adulterated by grinding hulls into it, or otherwise, so as to reduce the percentage of ammonia to 4 per cent or 6 per cent, the value of the meal will be decreased by 25 and 50 per cent of the value it would have, if it contained 8 per cent of ammonia. On the other hand, it not infrequently happens that meal contains 9 per cent, and sometimes even 10 per cent, of ammonia, and it is not reasonable and fair that a mill producing such meal should get full credit for the increased value.

As stated, the value of meal, whether used for feed or fertilizer, depends on its contents of ammonia, and the action of the Board requires the manufacturers of meal to guarantee and brand the amount of ammonia which the meal contains, on the bag containing the meal, or else on a tag attached thereto. This requires all meal to be sold on its merits. The Board of Agriculture regarded this as just and right, and considered it the only way of preventing the adulteration of meal, as the Department could not take action against manufacturers who sold adulterated or low-grade meal unless it were brought under the law as other fertilizer materials are, and required to have a guarantee and inspection tax. The Board has a right, under the law, to do this, but has no right to require inspection tax on meal when used as feed, but under another law—the Pure Food Law—the Board of Agriculture has a legal right to fix standards which will show to the purchaser the quality of the

meal which he purchases. In this way he will be protected against fraud when purchasing meal for feed. It is just as important to have a high-grade meal for feeding purposes as it is for fertilizing purposes, and the same constituents that give it value for fertilizer, also give to it its high feeding value. Under the Pure Food Law, a severe penalty is attached for the selling of a product of a lower grade than it is guaranteed to be, the provision being as follows: "Any person who shall violate any of the provisions of this act shall be guilty of a misdemeanor, and for such offense shall be fined not exceeding two hundred dollars for the first offense, and for each subsequent one, not exceeding three hundred dollars, or be imprisoned not exceeding one year, or both, in the discretion of the Court."

The following are the resolutions of the Board of Agriculture regarding cotton-seed meal as feed and fertilizer. These resolutions have the force of law:

"*Resolved*, That all cotton-seed meal sold for use as fertilizer shall be subject to an inspection tax at 20 cents per ton, and to be subject to inspection as other fertilizers and fertilizer materials, unless sold to manufacturers for use in manufacturing fertilizers. That all cotton-seed meal offered for sale as fertilizer shall have branded on bag, or tag attached thereto, the following data:

"1. Cotton-seed meal.

"2. Weight of package.

"3 Ammonia or nitrogen, ... per cent.

"4. Name and address of manufacturer.

"To go into effect January 1, 1902.

"*Resolved 1*, That the Board of Agriculture fix the standard of 'first-rate' cotton-seed meal at 6.60 per cent nitrogen, or its equivalent of ammonia (8 per cent), and that all cotton-seed meal containing this minimum, or a greater percentage of nitrogen or ammonia, may be sold with or without branding the percentage of nitrogen or ammonia on the bag or tag.

"2. That all cotton-seed meal containing less than the above minimum percentage of nitrogen or ammonia shall be branded as 'second-grade' meal, and shall have on the bag, or tag attached thereto, the guaranteed percentage of nitrogen or ammonia.

"3. That all manufacturers, dealers, or agents selling or offering for sale in this State any cotton-seed meal for use as feed, shall either first brand on the bags in which the meal is to be offered for sale, or else on a tag (of a form approved by the Commissioner of Agriculture), to be attached to the bag, the following data:

"1. Cotton-seed meal.

"2. Grade—first-grade or second-grade.

"3. Weight of package.

"4. Nitrogen or ammonia, either, but not both, ... per cent.

"5. Name and address of manufacturer.

"4. That anyone offering cotton-seed meal for feed, which is below the standard fixed in section 1, unless branded as provided in section 2, of this resolution, shall be subject to the penalties provided in the Pure Food Law, passed by the Legislature of 1899.

"To go into effect January 1, 1902."

NEW BUILDINGS AT AGRICULTURAL AND MECHANICAL COLLEGE.

The burning of Watauga Hall on the night of November 29, caused a loss to the Agricultural and Mechanical College of over $11,000. Of this amount, $6,000 will be recovered from the insurance companies. The building was almost a total loss. The College was already crowded with students, and not able to accommodate all the boys who applied for admission. The work which the college is doing in training young men in mechanics, in engineering, in textile work, in agriculture, is of too great and vital interest to the State to be checked or allowed to languish. The necessity was absolute to restore the burnt building, and to provide additional room for the increasing demands upon the College by the young men of the State who seek industrial or agricultural education. The burnt building contained the dining-room and kitchen and a limited number of dormitories. There is not a chapel or assembly room on the grounds. The Board of Agriculture, which is now in control of the College, determined that such a condition should exist no longer. The Board met, and after carefully considering all the surroundings and the necessities of the institution, decided to rebuild Watauga Hall for dormitories only. This will provide accommodations for about fifty more students. In addition to this, a new two-story building and basement, with dining-room on the first floor, capable of seating five hundred students, and chapel and assembly-room on second floor, was provided for. Even these additions will satisfy the constantly increasing demands upon the College for only a few years.

The institution is doing a great work for the State, and for the young men who take advantage of the opportunities offered. The Governor and Council of State gave their assent to borrowing the necessary additional funds to erect the two buildings, which will be begun as soon as the preliminary steps can be taken of selecting locations, choosing plans and specifications, etc. The new buildings must be ready in time for the opening of the College year, the first of September, and the College will be better prepared than ever for doing its noble work.

CATTLE QUARANTINE IN THE WESTERN COUNTIES.

The cattle quarantine district in the western counties is one of great importance to the people of that section. All of the counties west of the Blue Ridge have been admitted by the Secretary of Agriculture, at Washington, into what is known as the permanently exempted area, to remain so on condition that the State authorities provide adequate safeguards against tick infection among the cattle in those counties. The Board of Agriculture is making an effort to extend the boundaries of this exempted area, provided it can be done with safety to the cattle of the mountain counties, and will operate through the State Veterinarian, and cattle inspectors, in the effort to rid the counties of McDowell, Burke, Caldwell, Wilkes and Surry of the tick pest, which is so fatal to cattle which have not become immune to the poison. If this can be successfully done, greater security will be given the mountain cattle by removing the danger line to a greater distance, and at the same time a great advantage will accrue to the cattle-owners in the counties named, by giving them free access with their cattle during certain portions of the year to the mountain counties, where a much better market is to be had.

It is the purpose of the Board to continue the work of exterminating the

tick pest by adding every year a new district. There is no reason why practically the whole State should not be eventually rid of this dangerous insect, which has caused immense losses among cattle throughout the State, oftentimes without the owners having an idea of the real cause of their cattle's sickness.

The cattle industry, which has become and will remain one of profit, can not be fully developed in the State as it ought to be until this tiny but fatal enemy of cattle life is exterminated.

The following are the resolutions passed by the Board:

"*Resolved*, That from November 15, 1901, to January 31, 1902, no cattle may be shipped, driven or allowed to stray into that portion of North Carolina exempt from the Federal quarantine, nor into the counties of Surry, Wilkes, Caldwell, Burke and McDowell, from any point below the Federal quarantine line, nor from Rabun, Towns and Union counties, Georgia.

"*Provided*, This regulation shall not apply to interstate traffic by rail or boat transacted in accordance with the Federal regulations relating thereto, or to uninfected cattle exempted by special permit of the United States Secretary of Agriculture.

"**Provided further*, That from November 15, 1901, to February 15, 1902, cattle may be shipped or driven from Surry, Wilkes, Caldwell, Burke and McDowell counties into that portion of North Carolina exempted by the Federal quarantine when found free of infection upon inspection by officers of this Department, or of the United States Department of Agriculture.

"That all of the counties of Surry, Wilkes, Caldwell, Burke and McDowell be included within the partially exempted area for 1902, in which efforts for the extermination of the cattle-tick are to be made.

"*Resolved*, That this Board solicits the consideration of the United States Secretary of Agriculture of a petition from I. D. Morris and others, believing that it will conserve the public interests and safety of the cattle trade, and remove from the petitioners a needless and unjust burden, and the State Veterinarian is accordingly instructed to correspond with the Federal authorities and endeavor to have this petition granted."

In connection with the fire at the Agricultural and Mechanical College, the Board passed the following resolutions, unanimously and by a rising vote:

"The Board of Agriculture, having heard with pleasure and with pride of the arduous efforts of the students of the North Carolina College of Agriculture and Mechanic Arts to extinguish Watauga Hall when it was burning, and of their self-sacrificing heroism in saving the College Infirmary and other State property, desires to place on record its hearty appreciation and commendation of their courage and devotion to their College. The Board especially desires to signify its approval of the conduct of Cadet-Lieut. L. N. Boney, who, as Officer-of-the-Day, rose superior to all personal considerations and devoted his entire efforts to awakening and conducting his endangered comrades from the burning building.

"That the President of the Agricultural and Mechanical College is requested to have this resolution read to the cadet body, and that a copy be furnished by the Secretary to Lieutenant Boney."

"That the thanks of the Board be tendered to the city fire department for their efforts to extinguish the fire at the College."

* The operation of this clause from January 31 to February 15 is conditional upon the approval of the United States Secretary of Agriculture.

SECOND REPORT OF WORK ON THE DEPARTMENT'S TEST FARMS FOR SEASON 1901, INCLUDING FERTILIZER AND OTHER TESTS WITH CORN AND COTTON.

BY B. W. KILGORE, STATE CHEMIST,
AND
R. W. POU, SUPERINTENDENT TARBORO TEST FARM,
J. L. McKINNON, SUPERINTENDENT RED SPRINGS TEST FARM.

INTRODUCTION.

On the following pages are recorded the results of our second year's work with cotton and corn on the Department's Test Farms, which were established for the purpose of making thorough and systematic study of the fertilizers best suited to different crops and soils, as well as the culture methods and varieties of crops now grown, and new crops best suited to the different sections of the State. Considerable data has been omitted from this report and will be allowed to accumulate for future use. The results of tests with wheat, oats, and rye and grasses and forage plants are reserved for a bulletin to be issued in July or August, and in time to be of the greatest value in connection with the late summer and fall planting of these crops. It is proposed to issue in the future reports on the experimental work with different crops, so as to have them appear just before the season for planting the particular crop or crops. This report on cotton and corn is sent out at this time so as to give those interested opportunity to examine, before planting-time the coming spring, the results obtained in 1901 with different fertilizer applications, methods of culture, and varieties of cotton and corn on the soils on which the work is being conducted.

The farmers of the State paid for fertilizers in 1900 not less than $5,000,000, and in 1901 the fertilizer bill was fully $6,000,000.

"There is justly much doubt in the minds of farmers as to whether or not they are using the fertilizer and the quantity of that fertilizer best suited to give them the most profitable results. There are quite a number of types of soil in the State, each one of which represents a considerable area. These different kinds of soil likely differ in their fertilizer requirements. The various classes of plants grown on them certainly do. The only thoroughly practical way of determining the proportions of nitrogen (ammonia), phosphoric acid and potash, that are best suited to the different crops and soils, as well as the most profitable amounts of these valuable fertilizer constituents to use, is to actually grow the crops on the particular soil in question, and apply varying quantities of nitrogen, phosphoric acid, and potash in the materials which supply them. By doing this, and giving the areas with different amounts of fertilizers the same treatment during the growing season, and submitting the yields to the careful test of the balance, nature gives the answer desired. This is the practical as well as the scientific way of dealing with this and like subjects—going direct to the soils and plants, and making known our wants in such a way as to induce them to give the most intelligent answers as to what they need, to do the best services for man.

"To be of value, work of this kind must be carefully done, and this requires skill and experience with soils, plants and fertilizers, and in addition

costs some money. But the farmer's outlay for fertilizers, as well as his need and desire to use them in the best and most economical way, not only justifies, but calls for the conduct of this kind of work."*

As explained in considerable detail in the first report (for 1900), the Department has located two

TEST FARMS

in the Eastern part of the State, with the view of studying in the most thorough and practical way, on the soils themselves, the fertilizer applications, culture methods, and the varieties of crops that can be used with best results on these soils.

TARBORO TEST FARM.

This farm is situated about three miles west of Tarboro, in Edgecombe County, on what is known as the "Battle-Bryan Farm." Something more than twenty acres are covered by the experiments, the land being given rent free by Mr. John W. B. Battle, of Tarboro. The soil on this place is a fine sandy loam, with clay sub-soil 15 to 20 inches below the surface. It was the judgment of a large number of good farmers at the places visited in looking for a suitable location, and our own observation, that this type of soil represented a very large area of the agricultural lands of the east—60 per cent, or more. We have been pleased to have this view confirmed by the results of the soil survey of a strip eight miles wide along the railroads from Raleigh to New Bern. The soil expert who did the work in connection with the soil survey, also examined the soil on this place. The Battle-Bryan farm is one of the oldest in the county, and the particular soil on which our tests are being conducted has long been in cultivation, and is in rather thin condition. It is fairly uniform, with the exception of a small strip near the road, where more or less barn-yard manure has been used during the past few years. The results on this strip were excluded from comparison in last year's work, and will have to be allowed for again this season.

RED SPRINGS TEST FARM.

The Tarboro farm in Edgecombe County is toward the northern end of the coastal plain section of the State. The other farm is just outside the corporate limit of the town of Red Springs, in Robeson County, in the southern end of the coastal plain formation. It may be well to add that the coastal plain soils make up about 40 per cent of the area of the State. The soil on the Red Springs farm is a sandy loam, the sand being much coarser than that on the Tarboro farm, and the depth to clay sub-soil is also greater—20 to 30 inches.

THE PLATS.

Except where noted, all the plats used for cotton and corn were one-tenth of an acre each (207½ by 21 feet), and were arranged one after the other, leaving a fourteen-foot driveway between each series of plats, and a distance between individual plats sufficient to accommodate two rows of cotton or corn, each row being fertilized like the plat it adjoined. The plats of each series are reasonably uniform, except in a few instances where previous applications of stable manure had been made. These results are noted in the table of yields.

* Extract from first report, 1900.

REVIEW OF THE WEATHER CONDITIONS DURING 1900 AND 1901.

BY C. F. VON HERRMANN, SECTION DIRECTOR WEATHER BUREAU.

The meteorological elements have, of course, a predominating influence on the growth of crops, and some, excessive rainfall for instance, may have merely a physical effect on the soil that may vitiate experiments with many kinds of fertilizers. A consideration of weather conditions during the years 1900 and 1901 is especially important because these years stand almost as representatives of extreme variations from the normal features of the weather generally experienced in North Carolina, and both were decidedly unfavorable for the growth of nearly all crops. A brief description of the general conditions for the State at large during the crop seasons of 1900 and 1901 will reveal the contrasts between them.

THE WEATHER DURING 1900.

The most striking features of the season of 1900 were the cold, wet, and, therefore, late spring, and a summer characterized by great heat, and almost continuous drought. Killing frosts occurred as late as April 5th, and very few signs of vegetable growth could be observed until after the middle of April. The drought of summer was intensified by unusually high temperatures and glaring sunshine. The departures from the normal conditions in temperature and precipitation for the entire area of North Carolina from July to October, 1900, were as follows:

	Excess in Temperature.	Deficiency in Precipitation.
July	1.7 degrees	1.57 inches
August	4.2 degrees	2.80 inches
September	4.5 degrees	1.90 inches
October	4.8 degrees	0.55 inches

The most remarkable period of excessive heat extended from August 6th to the close of the month, during which maximum temperatures from 90 degrees to over 100 degrees occurred on twenty-four consecutive days. As a result the cotton crop was injured almost beyond recovery; old and young corn were seriously damaged, and much fodder was ruined; the cures of tobacco made late in the season were poor on account of scorching and premature ripening of the leaves; gardens became almost worthless. It is to be observed, however, that the effect of drought can be largely mitigated by thorough cultivation to form an earth mulch and prevent the evaporation of the moisture in the soil. Excessive rainfall is a greater disadvantage, because it entirely prevents work in the fields.

THE WEATHER DURING 1901.

The year 1901, as regards climate, must be considered the most unfavorable experienced in North Carolina during the past quarter of a century. This year was characterized by a very cold and unfavorable spring, and by a remarkable excess in rainfall. The amount of precipitation received at many stations during 1901 has never before been equaled.

In April there was a steady daily deficiency in mean temperature, and an entire absence of warm periods which usually herald the approach of spring.

The precipitation was excessive and a remarkable snow storm occurred in the western district on the 20th, which gave a depth of from 2 to 10 inches unmelted snow over twelve western counties, and extended east to the central Piedmont Plateau. Freezing temperatures occurred in the west as late as the 22d. May and June also were cold and wet. Therefore, the beginning of the season of 1901 was even more unfavorable than that of 1900, as farm work was pursued with difficulty, and the cold, wet soil long remained unfit for the germination of seeds.

The exceptional amounts of precipitation can not be better shown than by presenting the departures from the normal for the State at large during the agricultural season, say from March to September:

EXCESS IN PRECIPITATION, 1901.

March	0.07 inches
April	2.06 inches
May	3.76 inches
June	1.00 inches
July	0.98 inches
August	6.38 inches
September	1.28 inches
Total excess	15.53 inches

Attention is invited to the large excess in May, 3.76 inches, and in August 6.38 inches. The State average for August was 12.18 inches, the largest amount recorded since 1872, the year when authentic records began to be accumulated for the State. The excessive rainfall caused several destructive floods in all the rivers of the State so that large areas of bottom lands were abandoned; besides the damage by floods, washing of the soil, etc., the heavy rain had a very injurious effect by preventing the proper cultivation of crops, which became very foul. The largest monthly total rainfall ever recorded was 30.74 inches, at Highlands, in August, 1901, and the largest annual amount was 106 inches, at the same place. A graphical representation of the distribution of precipitation will show, however, that the rainfall during 1901 diminished gradually towards the northeast section of the State, and beyond the location of the Test Farms small deficiencies in annual rainfall were recorded even in 1901. The smallest total was about 40 inches, at Currituck Inlet.

WEATHER DATA AT THE TEST FARMS AND NEAREST STATIONS.

Standard instruments have been placed at each of the test farms and the records of temperature and rainfall have been reported to the Section Director of the United States Weather Bureau, at Raleigh, where they have been tabulated. The following tables present a summary of the chief weather elements for 1900 and 1901 at the test farms and nearest regular stations. At the test farms observations have been continued only two years, which is not a sufficient time to establish normals, but the stations at Tarboro and Lumberton have records for periods longer than ten years, and the average data are fairly representative of the conditions prevailing in the vicinity of the State farms:

TEMPERATURE AND RAINFALL AT AND NEAR TEST FARMS DURING 1901.

LUMBERTON, N. C., 1901.

	Temperature in Degrees Fahrenheit. Mean.	Departure from the Normal.	Highest.	Date.	Lowest.	Date.	Greatest Daily Range.	Precipitation in Inches. Total.	Departure from the Normal.	Greatest in 24 Hours.	Total Snowfall Unmelted.	Number Rainy Days.	Sky. Number Clear Days.	Number Partly Cloudy Days.	Number Cloudy Days.	Prevailing Direction of Wind.
1901.																
January	42.4	—2.7	74	11	24	14, 19	30	4.02	—1.18	1.16	------	8	8	13	10	------
February	39.8	—1.9	69	18	14	24	30	2.18	—1.72	0.88	7.0	4	7	15	6	------
March	51.1	—2.0	77	25	18	7	45	3.56	0.00	1.40	------	5	9	12	10	------
April	55.3	—7.6	76	30	38	12, 24	31	4.25	+0.69	1.70	------	9	10	10	10	------
May	72.1	+1.5	92	3	49	1	39	12.52	+7.25	4.12	------	13	6	7	18	------
June	76.8	—0.6	93	24, 25	59	8	25	5.47	—0.24	1.95	------	12	2	13	15	------
July	81.6	+1.6	97	25, 30	68	9, 10	23	6.54	+0.73	2.22	------	12	5	13	13	------
August	80.0	+1.7	97	1	68	31	22	6.97	+0.45	1.92	------	17	2	12	17	------
September	74.0	+2.0	92	13, 14, 16	54	21, 22	22	9.38	+5.45	4.48	------	8	8	12	10	------
October	60.3	—1.3	82	1	36	19	32	1.21	—2.25	0.81	------	3	13	10	8	------
November	45.0	—7.9	77	1	19	29	37	1.01	—1.12	0.62	------	4	17	9	4	------
December	42.0	—4.7	72	14	15	22	30	5.65	+3.85	1.93	T	10	6	14	11	------
Annual	60.0	—1.9	97	July 25	14	Feb. 24	45	62.76	+12.91	4.48	7.0	105	103	140	122	------

TEST FARMS AT RED SPRINGS, N. C., 1901.

1901.																
April	55.0	------	83	30	33	12	41	3.27	------	1.46	------	5	18	0	12	W
May	70.4	------	95	3	50	4	41	10.88	------	4.60	------	9	16	7	8	SW
June	76.1	------	94	24,25	55	8	34	5.47	------	2.00	------	8	17	9	4	W
July	80.8	------	99	25	66	10	28	11.27	------	4.10	------	7	17	11	3	W
August	79.0	------	92	11	68	2	22	7.75	------	1.65	------	13	12	19	0	SW
September	73.4	------	95	13	51	22	29	4.43	------	2.90	------	3?	18	7	5	NE
October	61.2	------	85	1,13,24	33	19,26	41	0.46	------	0.35	------	2	24	5	2	NE
November	45.3	------	82	1	17	29	44	1.01	------	0.45	------	3	23	2	5	NW
Total for April to Nov., inclusive	------	------	------	------	------	------	------	44.54	------	------	------	------	------	------	------	------

TEST FARM NEAR TARBORO, N. C., 1901.

1901.																
March	53.2	------	76	25	11	7	44	2.79	------	1.24	------	7	17	8	6	------
April	53.2	------	82	30	31	12	47	5.43	------	2.99	------	7	16	8	6	------
May	67.8	------	91	1,3	43	4	36	6.11	------	1.28	------	18	17	9	5	SW
June	75.5	------	95	24	52	10	34	1.47	------	0.49	------	8	24	4	2	SE
July	81.1	------	100	1,2	63	4	30	8.24	------	1.20	------	12	18	7	6	SW
August	------	------	------	------	------	------	------	11.04	------	3.47	------	12	------	------	------	------
September	72.4	------	93	15	54	20,26	28	6.81	------	2.94	------	8	22	4	4	SW
October	62.0	------	85	1	33	26	51	3.76	------	2.00	------	3	25	2	4	NW
November	44.8	------	75	1	22	22	37	1.62	------	1.42	------	2	------	------	------	NW
Total for March to Nov., inclusive	------	------	------	------	------	------	------	45.08	------	------	------	------	------	------	------	------

TEMPERATURE AND RAINFALL—CONTINUED.

TARBORO, N. C., 1901.

1901.	Temperature in Degrees Fahrenheit. Mean.	Departure from the Normal.	Highest.	Date.	Lowest.	Date.	Greatest Daily Range.	Precipitation in Inches. Total.	Departure from the Normal.	Greatest in 24 Hours.	Total Snowfall Unmelted.	Number Rainy Days.	Sky. Number Clear Days.	Number Partly Cloudy Days.	Number Cloudy Days.	Prevailing Direction of Wind.
January	41.4	+0.3	78	12	18	20	33	1.85	−2.45	0.89	1.0	9	15	4	12	NW
February	38.1	−6.4	73	19	12	24	30	1.92	−1.78	0.57	6.0	6	18	3	7	NW
March	53.6	+4.7	78	26	13	7	44	3.02	−0.69	1.27	------	7	19	2	10	SW
April	55 0	−4.5	80	30	35	12	42	5.45	+2.18	2.36	------	8	17	2	11	N
May	70.0	+0.9	93	2,4	46	4	47	5.54	−0.04	1.36	------	11	13	5	13	E
June	77.4	+1.4	99	26	55	9	36	1.29	−3.21	0.51	------	9	11	6	13	S
July	82.2	+3.5	104	1	67	9, 10, 19	32	8.24	+1.74	1.70	------	13	15	6	10	SW
August	80.4	+3.0	96	12	64	2, 26	28	11.61	+4.85	2.41	------	17	12	13	6	S
September	74.5	+3.0	95	14, 15, 16	50	22	32	8.24	+4.23	2.60	------	6	16	9	5	{ N NE
October	63.6	+4.4	90	2	33	19	40	3.51	−0.34	1.72	------	5	22	4	5	{ NE E
November	46.0	−5.0	80	2	18	29	39	1.23	−1.54	0.93	-----	5	18	5	7	NW
December	43.8	+0.7	79	30	10	21	38	5.11	+1.36	1.75	0.2	13	21	6	4	N
Annual	60.5	+0.5	104	July 1	10	Dec. 21	47	57.01	+4.31	2.60	7.2	109	197	65	103	NW

TEMPERATURE AND RAINFALL DATA IN COMPARISON WITH THE NORMALS.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
LUMBERTON, N. C.													
Normal temperatures	45.1	41.7	53.1	62.9	70.6	77.4	80.0	78.3	72.0	61.6	52.9	46.7	61.9
Monthly means 1900	42.8	41.6	49.4	61.2	70.4	76.8	82.9	83.8	76.4	66.0	54.2	42.7	62.4
Departures 1900	—2.3	—0.1	—3.7	—1.7	—0.2	—0.6	+2.9	+5.5	+4.4	+4.4	+1.3	—4.0	+0.5
Monthly means 1901	42.4	39.8	51.1	55.3	72.1	76.8	81.6	80.0	74.0	60.3	45.0	42.0	60.0
Departures 1901	—2.7	—1.9	—2.0	—7.6	+1.5	—0.6	+1.6	+1.7	+2.0	—1.3	—7.9	—4.7	—1.9
Normal precipitation	5.20	3.90	3.56	3.56	4.27	5.71	5.81	6.52	3.93	3.46	2.13	1.80	49.85
Monthly total 1900	2.85	6.11	4 79	5.14	2.88	3.17	3.00	1.50	1.83	3.32	4.17	5.28	44.04
Departures 1900	—2.35	+2.21	+1.23	+1.58	—1.39	—2.54	—2.81	—5.02	—2.10	—0.14	+2.04	+3.48	—5.81
Monthly total 1901	4.02	2.18	3.56	4.25	12.52	5.47	6.54	6.97	9.38	1.21	1.01	5.65	62.76
Departures 1901	—1.18	—1.72	0.00	+0.69	+8.25	—0.24	+0.73	+0.45	+5.45	—2.25	—1.12	+3.85	+12.91

TEMPERATURE AND RAINFALL DATA IN COMPARISON WITH THE NORMALS.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
TARBOBO, N. C.													
Normal temperatures	41.1	44.5	48.9	59.5	69.1	76.0	78.7	77.4	71.5	59.2	51.0	43.1	60.0
Monthly means 1900	42.0	41.3	48.3	59.5	68.9	77.7	83.4	84.2	77.0	67.4	55.6	41.8	62.3
Departures 1900	+0.9	−3.2	−0.6	0.0	−0.2	+1.7	+4.7	+6.8	+5.5	+8.2	+4.6	−1.3	+2.3
Monthly means 1901	41.4	38.1	53.6	55.0	70.0	77.4	82.2	80.4	74.5	63.6	46.0	43.8	60.5
Departures 1901	+0.3	−6.4	+4.7	−4.5	+0.9	+1.4	+3.5	+3.0	+3.0	+4.4	−5.0	+0.7	+0.5
Normal precipitation	4.30	3.70	3.71	3.27	5.58	4.50	6.50	6.76	4.01	3.85	2.77	3.75	52.70
Monthly total 1900	4.41	5.35	2.70	3.34	2.07	3.54	2.02	6.72	1.05	1.06	3.70	3.21	39.17
Departures 1900	+0.11	+1.65	−1.01	−0.07	−3.51	−0.96	−4.48	−0.04	−2.96	−2.79	+0.93	−0.54	−13.53
Monthly total 1901	1.85	1.92	3.02	5.45	5.54	1.29	8.24	11.61	8.24	3.51	1.23	5.11	57.01
Departures 1901	−2.45	−1.78	−0.69	+2.18	−0.04	−3.21	+1.74	+4.85	+4.23	−0.34	−1.54	+1.36	+4.31

Plus (+) indicates above the normal. Minus (−) below the normal.

The records presented in these tables fully substantiate the general account given above of the unfavorable conditions prevailing during 1900 and 1901. The deficiencies in temperature during the spring in both years are brought out, perhaps, better at Lumberton than at Tarboro, where as already stated, the rainfall was not quite so excessive and the temperature higher during 1901 than in other portions of the State. The annual normal rainfall at Tarboro (average of 20 years' records) is 52.70 inches. During 1900 the amount received was 39.17 inches, showing a deficiency for that year of 13.53 inches; continuous deficiencies occurred from May to October. On the other hand, during 1901 the total received at Tarboro was 57.01 inches, or 4.30 in excess of the normal, and 17.84 inches more than in 1900. The largest monthly total was 11.61 inches in August.

The normal rainfall at Lumberton, twenty miles from the test farm at Red Springs, is 49.85 inches (average of 16 years' records). During 1900 the amount received was 5.81 inches less than the average, while during 1901 the annual total at Lumberton, 62.76 inches, is 12.91 inches above the normal, and 18.62 inches more than was received during 1900.

Summing up, by a brief comparison of the two years, it is seen that both were characterized by cold, wet and late spring; that while the summer of 1900 was very hot and dry, the corresponding season of 1901 was cool and extremely wet; both were entirely disadvantageous for agricultural interests. These conditions must be kept in mind in discussing the results of the work at the test farms.

EFFECT OF SEASON ON RESULTS.

These unfavorable conditions have greatly influenced the results of the two years' work. Especially has this been true with regard to the effect of the various fertilizer applications. The rainfall having been deficient one year and exessive the other, these applications have not likely shown the effect on the crops they would have under more normal conditions. While this detracts greatly from the value of the results obtained in extreme seasons, it shows how uncertain it is to base too much on one, or even two, years' work, especially if the seasons are not representative, and emphasize the importance of continuing tests long enough to get average results to represent average conditions.

We are giving the results of our year's work with the above in mind, feeling that they are not representative of usual conditions, and asking that they be accepted and considered in this light. Because of all this we can the more readily see why it is not well to be too hasty in drawing conclusions, but rather wait until sufficient data has been obtained on which to base conclusions.

KIND, COMPOSITION AND COST OF FERTILIZER MATERIALS.

In the table below will be found the data in relation to the fertilizer materials employed. Cost, as there employed, means what was paid for them delivered at the depot, and does not include cost of hauling from station to farm, mixing and applying:

FERTILIZER MATERIALS USED IN 1901, THEIR COMPOSITION AND COST.

	Nitrogen.	Phosphoric Acid.					Potash.	Cost Per Ton Delivered at Depot.
		Water-Soluble.	Reverted.	Available.	Insoluble.	Total.		
Cotton-seed meal	7.08			2.80	.11	2.91	1.94	$25.00
Do	7.22			2.42	.28	2.70	1.79	25.00
Cotton-seed	3.13					1.58	1.32	16.00
Acid Phosphate		13.92	2.12	16.04	2.22	18.26		12.50
Ground Phosphate						33.05		10.00
Nitrate of Soda	15.85							47.00
Kainit							13.81	13.00
Muriate of Potash							49.52	45.00
Manure	1.15					.89	1.82	2.00
Lime								8.00

To economize space and to make more easy the representation of the fertilizer applications to the different plats, letters have been adopted to represent the valuable ingredients of fertilizers as follows:

Nitrogen is represented by *N*, which also means a given weight in pounds per acre of nitrogen. With cotton *N* represents 10 pounds of nitrogen (equal to 143 pounds cotton-seed meal) per acre, in the normal application; and with corn 9 pounds per acre.

Phosphoric Acid is represented by P, and this also means a definite number of pounds per acre of phosphoric acid, which, in the case of cotton, is 28 pounds (equal 200 pounds of 14 per cent acid phosphate).

Potash is represented by *K*, and this in the case of cotton means 10 pounds per acre, or 80 pounds kainit.

L equals *Lime* at the rate of 1,000 pounds per acre of slaked lime.

The results are given in detail on the following pages, with such comments as are seemed to be justified.

I.

FERTILIZER, CULTURE AND VARIETY TESTS WITH CORN.

(VARIETY: COCKE'S PROLIFIC.)

Preparation and Cultivation.—The field was in cotton in 1899, and the preparation, fertilization and cultivation given the plats in the experimental work of 1900 has been recorded in last year's report. This season's work is a repetition of that of last year, each plat having been used in the same way as in 1900, and given the same treatment as to preparation, cultivation and fertilization.

The plats were all broke alike with two-horse turning plow, eight to ten inches deep, on February 14th and 15th. Rows were run off 5¼ feet apart and 4 to 6 inches deep, the fertilizer materials, which were weighed out separately for each row, being distributed in the drill and covered with "double stock" plow, having two small shovels on it, April 1st. This slight

ridge was opened and the corn (Cocke's Prolific, obtained from Curry-Arrington Company, Rome, Ga.) planted 2½ feet apart on April 25th. The corn was thinned to one stalk to the hill.

With the exception of Plat 38, which was worked according to the custom of the section, with sweeps and turning plow, laying by with high ridge, all the plats were cultivated level, with what is known as "Avery's Truckers' Five-Tooth Cultivator," after first running the wide smoothing-harrow over the rows about the time the corn was coming up. The cultivation was rather deep, and with the small hoes on the cultivators early in the season and becoming shallower, and with the large hoes as the season advanced, and the roots found their way well out into the rows. This secured pretty thorough breaking of the land early in the season, and prevented the disturbance of the root system later. One to two furrows were run with the cultivator to the row about every ten days (when the seasons would allow) till July 4th, and an especial effort was made to work immediately after rains, in order to produce a fine dust mulch, with the shallow-running plows, to prevent the rapid evaporation of the water added to the soil by the rains. Including the furrows for opening the drills for fertilizer, covering same, and again opening for planting the corn, twenty furrows were run in cultivating the corn.

The second application of nitrogen as nitrate of soda to Plat 23, of cotton-seed meal to Plat 24, and of cotton-seed meal, acid phosphate and kainit to Plat 25 was made June 21st.

The corn was cut close to the ground and shocked from September 10th to 12th, and was husked and weighed (corn and stover separately) on October 18th to 24th.

The plan of experiments and results follow:

PLAN OF FERTILIZER AND OTHER TESTS WITH CORN.

Normal Fertilizer Application, 300 pounds to acre of Mixture containing—

Phosphoric Acid	7 per cent.
Potash	1½ per cent.
Nitrogen	3 per cent.

In scheme below—

P=21 pounds Phosphoric Acid=150 pounds (14 per cent) Acid Phosphate.
K=4½ pounds Potash= 36 pounds (12½ per cent) Kainit.
N=9 pounds Nitrogen= 130 pounds (7 per cent) Cotton-Seed Meal.

SIZE OF PLATS ONE-TENTH ACRE (207½x21 FEET).

Plat		*Applications.*			
1		N			
2		P			
3		K			
4		N	P		
5		N	K		
6		P	K		
7		N	P	K	
8		O			
9		N½	P	K	
10		N_2	P	K	
11		N_3	P	K	
12		N	P½	K	
13		N	P_2	K	
14		N	P_3	K	
15		N	P	K½	
16		N	P	K_2	
17		N	P	K_3	
18	½	(N	P	K)	
19	1½	(N	P	K)	
20	2	(N	P	K)	
21	3	(N	P	K)	
22		O			
23		N	P	K	Two applications of nitrogen: Half as meal at planting; balance as Nitrate of Soda later.
24		N	P	K	Two applications of nitrogen: Half at planting and half later; both as meal.
25		N	P	K	Two applications of all three materials: Half at planting and half later.
26		N	P	K	Rotation: First year, corn and peas; oats and vetch in fall. Second year, oats and vetch; peas in summer, and oats and vetch in fall. Third year, corn and peas; oats and vetch in fall.
27		N	P	K	Rotation: Same as 26 without any nitrogen in the fertilizer after first year.
28		P	K		After peanuts to furnish nitrogen.
29		P	K		After cow peas to furnish nitrogen.
30		P	K		After velvet beans to furnish nitrogen.
31		N	P	K	Ground phosphate rock to furnish phosphoric acid.
32		N	P	K	Deep application of fertilizer.
33		N	P	K	Broadcast application of fertilizer to compare with drill application.
34		O			
35		N	P	K	
36		N	P	KL	
37		Lime:			1,000 pounds slaked lime per acre broadcast.
38		N	P	K	Ridge to compare with level culture.

TABLE I—RESULTS OBTAINED AT THE TARBORO TEST FARM, SEASON 1901.

FERTILIZATION AND YIELD OF CORN PER ONE-TENTH ACRE PLAT AND PER ACRE.

No. of Plat.	Fertilizer Application.	Acid Phosphate in Pounds Per Acre.	Kainit in Pounds Per Acre.	Cotton-seed Meal in Pounds Per Acre.	Yield Per One-Tenth Acre Plat.		Total Bushels Per Acre.	Stover Per Acre, Pounds.	Increase over Unfertilized Plats Bushels Per Acre.	Value of Increase, Allowing 50 cts. per Bushel for Corn, $8 per Ton for Stover.	Cost of Fertilizer Application Per Acre.	Value of Increase over Cost of Fertilizer Application.
					Large Ears, Pounds.	Small Ears, Pounds.						
1	N*			127.1	301	14.5	47.80	3,250	31.75	$24.10	$1.60	$22.50
2	P*	131.2			214	15	34.60	2,890	18.60	16.10	.82	15.28
3	K*		32.6		160	17	26.40	1,980	10.40	8 34	.21	8.13
4	N P	109.0		127.1	165	19	27.80	1,900	11.80	8.81	2.28	6.56
5	N K		14.7	127.1	141	20.5	24.40	1,530	8.40	5.54	1.70	3.84
6	P K	131.2	32.6		119	18	20.70	1,780	4.70	4.70	1.03	3.67
7	N P K	109.0	14.7	127.1	121	18	21.00	1,330	5.00	3.04	2.38	.66
8	O				77	24	15.30	1,250				
9	$N_{1\frac{1}{2}}$ P K	120.1	23.6	63.6	100	15.5	17.50	1,540	1.50	2.13	1.70	.43
10	N_2 P K	86.8		254.2	124	20.00	21.80	2,070	5.80	6.40	3.74	2.66
11	N_3 P K	64.6		381.3	165	12.50	26.80	1,770	10.80	7.70	5 20	2.50
12	N $P_{1\frac{1}{2}}$ K	54.5	14.7	127.1	127	10.5	20.80	1,910	4.80	5.26	2.04	3.22
13	N P_2 K	218.0	14.7	127.1	162	9.75	26.00	1,880	10.00	7.74	3.06	4.68
14	N P_3 K	327.0	14.7	127.1	158	17.00	26.50	1,910	10.50	8.11	3.74	4.37
15	N P $K_{1\frac{1}{2}}$	109.0	7.3	127.1	153	10.25	24.70	1,810	8.70	6.81	2.33	4.48
16	N P K_2	109.0	29.4	127.1	164.5	10.00	26.40	1,700	10.40	7.22	2.48	4.74
17	N P K_3	109.0	44.1	127.1	151.5	14	25.10	1,770	9.00	6.80	2.58	4.22
18	½ (N P K)	54.5	7.3	63.6	129	10	21	1,480	5.00	3.64	1.19	2.45
19	1½ (N P K)	163.5	22.0	190.7	137	11	22.40	1,780	6.40	5.54	3.57	1.97

TABLE NO. I—Continued.

FERTILIZATION AND YIELD OF CORN PER ONE-TENTH ACRE PLAT AND PER ACRE.

No. of Plat.	Fertilizer Application.	Acid Phosphate in Pounds Per Acre.	Kainit in Pounds Per Acre.	Cotton-seed Meal in Pounds Per Acre.	Yield Per One-Tenth Acre Plat.		Total Bushels Per Acre.	Stover Per Acre, Pounds.	Increase Over Unfertilized Plats, Bushels Per Acre.	Value of Increase, Allowing 50 cts. per Bushel for Corn, $8 per Ton for Stover.	Cost of Fertilizer Application Per Acre.	Value of Increase over Cost of Fertilizer Application.
					Large Ears, Pounds.	Small Ears, Pounds.						
20	2 (N P K)	218.0	29.4	254.2	42.75	12	23.40	1,680	7.40	$5.64	$4.76	$0.88
21	3 (N P K)	327.0	44.1	381.3	169	16	28	1,850	12.00	8.62	7.14	1.48
22	O				91	20	16.80	1,140				
23	N P K †	120.1	23.6	‖63.6 ‖‖28.4	126	15.5	21.40	1,460	5.40	3.76	2.37	1.39
24	N P K ‡	109.0	14.7	‖63.6 ‖63.6	138.5	16	23.40	1,590	7.40	5.28	2.38	2.90
25	N P K §	54.5 54.5	7.3 7.3	‖63.6 ‖63.6	161.75	13	26.40	1,720	10.40	7.30	2.38	4.92
26	N P K ¶											
27	N P K ¶											

*These plats are some better than others on account of previous application of stable manure. The results should not be considered in comparison with others.

†Two applications of nitrogen: One-half as meal at planting and one-half as nitrate of soda on June 21.

‡Two applications of nitrogen: One-half at planting and one-half on June 21. Both as meal.

§Two applications of all materials: One-half at planting and one-half on June 21.

‖ Cotton-seed meal.

‖ ‖ Nitrate of soda.

¶Rotation plats; planted in oats and vetch in the fall of 1900, followed by peas in summer of 1901, and again in oats and vetch in fall of 1901.

TABLE NO II—RESULTS OBTAINED AT THE TARBORO TEST FARM, SEASON 1901.

FERTILIZATION AND YIELD OF CORN PER PLAT AND PER ACRE.

[This is a continuation of the experiment reported in the preceding table (I), but the results were obtained on a separate series of plats.]

No. of Plat.	Fertilizer Application.	Acid Phosphate in Pounds Per Acre.	Kainit in Pounds Per Acre.	Cotton-seed Meal in Pounds Per Acre.	Yield Per One-Tenth Acre Plat.		Total Bushels Per Acre.	Stover Per Acre, Pounds.	Increase over Un-fertilized Plats, Bushels Per Acre.	Value of Increase, Allowing 50 cts. per Bushel for Corn, $8 per Ton for Stover.	Cost of Fertilizer Application Per Acre.	Value of Increase over Cost of Fertilizer Application.
					Large Ears, Pounds.	Small Ears, Pounds.						
28	P K *	131.2	32.6	Peanuts.	138	6	21.80	2,000	3.40	$4.10	$1.03	$3.07
29	P K †	131.2	32.6	Soja Beans.	152	10	24.40	2,200	6.00	6.20	1.03	5.17
30	P K ‡	131.2	32.6	Velvet Beans	235	6	36.50	2,280	18.10	12.57	1.03	11.54
31	N P K §	** 60.2	14.7	127.1	140	10	22.60	1,860	4.20	3.94	2.08	1.86
32	N P K ¶	109.0	14.7	127.1	144	10.5	23.40	1,880	5.00	4.42	2.38	2.04
33	N P K °	109.0	14.7	127.1	120	12	20.00	1,720	1.60	2.08	2.38	----
34	O	----	----	----	104	17.50	18.40	1,400	----	----	----	----
35	N P K	109.0	14.7	127.1	140	17.50	22.80	1,600	4.40	3.00	2.38	.62
36	N P K L ‖	109.0	14.7	127.1	156	12	25.40	1,800	7.00	5.10	2.38	2.72
37	Lime ††	----	----	----	138	10.5	22.5	1,480	4.10	2.37	2.00	.37
38	N P K ‡‡	109.0	14.7	127.1	140	11	22.8	1,400	4.40	2.20	2.38	----
	Average yield	per acre	----	----	----	----	21.58	1,795	----	----	----	----

* To show effect of Peanuts grown last season.
† To show effect of Soja Beans grown last season and turned under in winter.
‡ To show effect of Velvet Beans grown last season and turned under in winter.
§ The phosphoric acid in this plat came from ground and untreated phosphate to compare with phosphoric acid from acid phosphate.
¶ Deep application of fertilizer.
° Fertilizer applied broadcast to compare with drill application.
†† 1,000 pounds slaked lime was applied broadcast the previous year.
‖ Limed in the spring of 1900.
** Ground phosphate rock.
‡‡ Ridge culture to compare with level culture.

VELVET BEANS ON LIGHT SANDY SOIL, SUCH AS PRECEDED CORN ON PLAT 30.—TARBORO TEST FARM.

COMMENTS ON RESULTS.

Under this head last year the following statement was made: "The very dry and unfavorable season has taken much from the value of the year's work. Besides, it is never safe or advisable to attempt to draw conclusions from the experiments of a single season." The crop year just past has been an opposite extreme from that of 1900, in that it was a very wet year and much of the effect of the fertilizer applications was doubtless lost by leaching by the heavy rains beyond the roots of the plants, especially as the plats under experimentation, except those on which green crops were grown last year, have been long cultivated in clean crops and have very little organic matter in them to assist the naturally open, sandy soil in holding fertilizer materials. It is better then again this year to merely make some comments on the results themselves and in connection with last year's results, and reserve conclusions until there is sufficient data on which to base them.

1. Fertilizer applications on corn paid better in the wet year of 1901 than they did in the dry year of 1900. This may have been due to corn on the nothing plats getting in 1900 the benefit of some unused fertilizer from the cotton crop of 1899. The fertilized plats, however, had the same opportunity. The nothing plats yielded more in 1900 than they did in 1901, and the increase due to fertilizer applications was, therefore, greater in 1901 than in 1900. All the fertilizer applications more than paid for themselves; some of them quite handsomely in the increased value of the product, in the season just past, with the exception of Plat 33, where the fertilizer was applied broadcast, all the rest being in the drill, and Plat 38, where the corn was cultivated and laid by on a ridge to compare with level culture given all other plats.

2. Comparison of yields on Plats 9 to 17, inclusive, show increased quantities of nitrogen, phosphoric acid and potash in the normal mixture to have increased at considerable profit the yield of corn, the increase in yield being about equally in favor of nitrogen and phosphoric acid, and the increase in value of product being about equally in favor of phosphoric acid and potash. The latter is due to the greater cost of nitrogen over phosphoric acid and potash.

3. The results do not indicate that this soil is more in need of potash than of phosphoric acid. In fact, the results point rather to the reverse, the difference, however, being too slight and the data too limited to justify more than a comment.

4. Increased applications of all materials gave greater yields, but at small profit, on account of cost of fertilizers, as is seen from the following data:

CORN AFTER VELVET BEANS ON LIGHT SANDY SOIL. YIELD 36.5 BUSHELS PER ACRE.—TARBORO TEST FARM.

	Fertilizer.	Yield.
Plat 7	300 pounds	21.0 bushels.
Plat 19	450 "	22.4 "
Plat 20	600 "	23.4 "
Plat 21	900 "	28.0 "

5. Comparison of the increased yields on Plats 7 and 38 over the nothing plats show level culture to have given slightly better results than ridge culture. It would seem that the past season of heavy rains has been a very severe test of flat culture, and it has shown up well. It should be more generally followed.

6. Last year's results showed good profit to come from a division of the nitrogen of the fertilizer, applying one-half at planting and one-half late in the growing season. The present year's work on this subject resulted as follows:

	Increase over Unfertilized Plats.
Plat 7. One application of all materials	5.00 bushels
Plat 25. Two applications of all materials	10.40 "
Plat 24. Phosphoric acid and potash, all applied at planting; 2 applications of nitrogen, both as meal	7.40 "
Plat 23. Phosphoric acid and potash, all applied at planting; 2 applications of nitrogen; first half as meal; second half as nitrate of soda	5.40 "

Last year the second application of nitrate of soda gave best results; this year the yields are in favor of cotton-seed meal, the difference being likely due to the ease with which nitrate of soda is washed from sandy soils in wet weather.

7. The yields on Plats 28, 29 and 30, in Table 2, show the effect of previous leguminous crops on the growth of corn, the increase (18.1 bushels per acre) on Plat 30, which grew a heavy crop of velvet beans in 1900, being specially noteworthy. The value of this increase amounts to $11.54 per acre, valueing the corn at fifty cents per bushel and the stover at $8.00 per ton. Should corn be put at $1.00 per bushel (the present price) the increase due to velvet beans would be $23.08 instead of $11.54. This plat received at the rate per acre in 1900, acid phosphate 120.6 pounds and potash 14.7, valued at 88 cents, and in 1901 the corn was fertilized with only acid phosphate and potash to the value of $1.03.

In calculating the value of the increase in crop on the several plats due to the fertilizer applications, corn has been valued at fifty cents per bushel and stover at $8.00 per ton. These are only about half values, on account of the high prevailing prices of grain and feed, but would be, we think, reasonable values in ordinary seasons.

CORN ON MEDIUM DARK SANDY SOIL AFTER PEAS.—TARBORO TEST FARM.

VARIETY TEST OF CORN.

The fertilizer application per acre in this test was:

N—9 pounds nitrogen	127.1 pounds of cotton-seed meal.
P—21 pounds phosphoric acid	109.0 pounds acid phosphate.
K—4.5 pounds potash	14.7 pounds kainit.
Total	250.8 pounds per acre.

Cost of fertilizer application per acre, $2.38.

RESULTS OBTAINED IN VARIETY TEST OF CORN.

TARBORO FARM.

Number 103¾-Rows in Test of each Variety.	Variety in Order of Productiveness.	Yield in Bushels Per Acre.
6	Weekley's Improved	29.50
6	Cocke's Prolific	28.10
6	Sanders' Improved	27.04
6	Native	26.85
6	Tennessee Yellow	26.56
6	Holt's Strawberry	25.73
6	Improved Golden Dent	22.53
6	Champion Dent	22.21
6	Hickory King	21.42

RED SPRINGS.

7	Weekley's Improved	18.95
7	Holt's Strawberry	17.31
7	Cocke's Prolific	15.28
7	Native	14.12
7	Improved Golden Dent	14.05
7	Sanders' Improved	14.04
7	Tennessee Yellow	13.54
7	Hickory King	12.42
7	Champion Dent	11.27

COMMENTS ON VARIETY TESTS.

All the kinds of corn received the same fertilizer applications at the two places and at each place the culture treatment was the same.

Six and seven rows respectively at Tarboro and Red Springs were devoted to the test of each variety. The rows were 103¾ feet long and six of them, therefore, equalled approximately one-fifteenth of an acre. One row of each of the nine varieties followed the other and then this was repeated five and six times respectively at the two places, making six and seven rows of each kind. This was also used as test of planting in rows of different widths and distances in the rows. The results of this latter test follow in another table.

The varieties at each place are arranged in order of productiveness, which renders unnecessary further comment.

SOURCE OF VARIETIES.

The varieties of corn used in the preceding test were obtained from the following sources:

Cocke's Prolific, Curry-Arrington Co., Rome, Ga.
Tennessee Yellow, Curry-Arrington Co., Rome, Ga.
Champion Dent, Alexander Seed Co., Augusta, Ga.
Hickory King, Alexander Seed Co., Augusta, Ga.
Weekley's Improved, J. F. Weekley, Ulmers, S. C.
Sanders' Improved, W. S. Sanders, Danielsville, Ga.
Holt's Strawberry, T. W. Wood & Sons, Richmond, Va.
Improved Golden Dent, T. W. Wood & Sons, Richmond, Va.
Native.

NOTE.—A considerable quantity of well-selected seed of Cocke's Prolific Corn, grown away from any other kind of corn and which is therefore pure, was saved for seed. This is a white corn with medium size ear and small cob, bearing one to three and sometimes four ears to the stalk.

DISTANCE TEST OF CORN.

TARBORO FARM.

No. of Rows in Each Test.	Width of Rows.	Distance of Planting in the Drill One Stalk to a Place.	Yield Per Acre in Bushels.
9	Four feet	Two feet	28.63
9	Four feet	Three feet	28.41
9	Four feet	Four feet	24.40
9	Five feet	Two feet	22.53
9	Five feet	Three feet	24.26
9	Five feet	Four feet	23.00
		RED SPRINGS.	
9	Three and one-half feet	Three and one-half feet	9.20
9	Four feet	Two feet	10.00
9	Four feet	Three feet	10.73
9	Four feet	Four feet	16.24
9	Five feet	Two feet	20.04
9	Five feet	Three feet	17.90
9	Five feet	Four feet	18.31

COMMENTS ON DISTANCE TEST.

As previously stated the variety test was also used to obtain data regarding planting in rows of different widths and different distances in the rows, thinning to one stalk in a place. One row of each of the nine kinds of corn was planted after the other, and the order repeated a sufficient number of times to give one row of all the nine kinds of corn to the test of each width row and each distance in the drill. This gave nine 103¾ foot rows to each test. It will require a number of repetitions of this test to arrive at a fair idea of the best width of rows and distance in rows for planting corn on the type of soil used in the experiment. This will no doubt vary with the different kinds of corn, and data bearing on this point was furnished by this test, but will be reserved for future use.

METHODS OF HARVESTING CORN.*

The usual method of harvesting corn in the State is to pull the ears, leaving the blades and stalks, or pull the ears and blades and leave the stalks in the field. This is a very wasteful practice, as facts show. In the Northeast and Northwest it is almost the universal practice to cut the entire corn plant down to the ground at the glazing stage of the grain, and put up in good-size conical shocks to cure. After the plant has thoroughly cured, the ears are

* This is largely a reprint from the first report made in 1900.

shucked out, either by hand, or more generally and economically, where large areas are involved, by putting through a shredder, which husks the corn and tears the stalks and blades to shreds and puts them in much better shape for feeding. A considerable number of corn harvesters and shredders were put in operation by our good-size farmers during the past two years.

Three years' experiments at the Maryland Experiment Station, and one careful test at the Georgia Station show, as an average, that of the entire corn plant, 46 per cent is ear (grain and cob), and 54 per cent corn fodder (all the plant except the ear). Of the corn fodder practically 60 per cent is stalk, 30 per cent blades, and 10 per cent shucks.

The corn on both the Test Farms was cut and shocked in 1900 and 1901. After curing well, the ears were shucked and weighed, as was also the corn fodder. The results are given in the table of results.

The average yield at Tarboro in 1900 was 25.2 bushels ears per acre, or 1663.2 pounds, allowing 66 pounds grain and cob per bushel. The corn fodder corresponding to this amount of grain was 2246.7 pounds. The water was determined in ears and fodder in the laboratory, and the dry matter (the whole portion minus water and that which has feeding value), in the ears from the average acre, was found to be 1453.7 pounds, or 42.4 per cent, while the dry matter in the fodder from the same area was 1981.6 pounds, or 57.6 per cent of the whole plant. Most of the latter, if left in the field, is wasted.

But only that portion of a feed which is actually digested or dissolved in the juices of the animal stomach is of value. A large number of digestion experiments and feeding trials with animals have shown that the portion of corn fodder eaten has about the nutritive value of ordinary grass hay. When the stalks are fed whole a good deal will be left uneaten, but if cut up in a corn cutter, or shredded in machines for that purpose, the greater part will be consumed.

The experiments referred to at the Maryland Station, showed that of the total digestible (valuable) material in the corn plant, 48.2 per cent came from the fodder and 51.8 per cent from the ears, the ears being more largely taken up in the animal than the fodder. Using well-known and accepted figures in connection with our tests already referred to, and calculating by means of these the digestible matter in our average acre crop, it is found that the ears gave 1144 pounds, or 50.2 per cent, and the fodder 1133 pounds, or 49.8 per cent, of the feeding value of the corn crop. These figures agree well with those obtained elsewhere, and show how much valuable feed is lost by harvesting corn as is usually done in this State.

The figures of our tests may be briefly summarized as follows:

COMPARATIVE FEEDING VALUE OF EARS AND FODDER FROM ONE ACRE.

	Yield Per Acre. Pounds.	Dry Matter. Pounds.	Per Cent in Each.	Digestible Matter. Pounds.	Per Cent in Each.
Ears 25.2 bushels	1,663.2	1,453.7	42.4	1,144	50.2
Fodder	2,246.7	1,981.6	57.6	1,133	49.8
Maryland Station results –					
Ears					51.8
Fodder					48.2

CORN HARVESTER AND BINDER AT WORK.

Taking the corn plant as a whole, practically

46 per cent is ear (grain and cob) and
54 per cent corn fodder (stalk, blades and shucks).

Total, 100

Of the corn fodder or stover (all the plant except the grain and cob) practically

60 per cent is stalk,
30 per cent is blades,
10 per cent is shucks.

Total, 100

Animals can get more out of the corn ear than they can from the corn fodder. On basis of what is actually used by animals—the valuable or digestible part—practically

51 per cent is ear, and
49 per cent fodder (stalks, blades and shucks).

Total, 100

Are not these figures strong enough to at least justify an effort on the part of everyone to save the corn plant as is done so successfully by certain farmers of this State, and so largely elsewhere, and to get all that is possible of its feeding value? It could then be grown at greater profit on our soils.

VIEW OF BETWEEN 1,000 AND 2,000 ACRES OF STUMPLESS, LEVEL LAND, WELL ADAPTED TO IMPROVED AGRICULTURAL MACHINERY, IN EDGECOMBE COUNTY.

II.

FERTILIZER, CULTURE AND VARIETY TESTS WITH COTTON.

(VARIETY: CULPEPPER'S IMPROVED.)

Preparation and Cultivation.—The cotton plats were separated from the corn plats by a fourteen-foot driveway and turn-road. The land was in cotton in 1899 and the preparation, fertilization and cultivation given the plats in 1900 has been recorded in the report of the experimental work for that year. This year's work has been a repetition of that of last season, each plat having been used in the same way as in 1900, and given the same treatment as to preparation, cultivation and fertilizer application.

The plats were all broken alike with two-horse turning plow eight to ten inches deep on February 8th to 11th, and was then harrowed smooth. Rows were run off 3½ feet apart and 6 to 8 inches deep, and the fertilizer materials, which were weighed separately, and with great care for each row, distributed in this drill April 8th and 9th, and covered with one furrow of "double-stock" plow. On April 16th two small furrows were added with one-horse turning plow and the cotton planted. A smoothing harrow was run across the rows on April 29th, after which the cultivation was level, and with Truckers' Cultivator (the same used for corn), running it moderately deep at the beginning and becoming shallower as the plants developed and the root systems extended into the middle of the rows. The cultivator was never run more than twice to the row at a time, as this more than covered the middle, and an effort was made to work over the plats as quickly as possible immediately after rains, to break the crust formed by the showers, and leave a dust mulch to check evaporation. The cultivator was run about 1½ to 2 inches deep toward the close of the season. It was attempted to cultivate every ten days, which had to be changed, of course, to suit the seasons. The last cultivation was on August 12th, and in all, 21 furrows were run in making the cotton crop.

The cotton was hoed twice and thinned as nearly as possible to a stand of one stalk every fifteen inches in the row.

The plan of the tests and detailed results follow in the tables:

PLAN OF FERTILIZER AND OTHER TESTS WITH COTTON.

Normal application, 400 pounds to acre of mixture containing:

Phosphoric Acid	7 per cent.
Potash	2½ per cent.
Nitrogen	2½ per cent.

In scheme below—

P=28 pounds Phosphoric Acid=	200 pounds	(14 per cent) Acid Phosphate.
K=10 pounds Potash=	80 pounds	(12½ per cent) Kainit.
N=10 pounds Nitrogen=	143 pounds	(7 per cent) Cotton-seed Meal.

VIEW ON TARBORO TEST FARM.—DRIVEWAY BETWEEN COTTON AND CORN PLATS.

SIZE OF PLATS ONE-TENTH ACRE ($207\frac{1}{2} \times 21$ FEET).

Plat.	*Applications*					
1		N				
2		P				
3		K				
4		N	P			
5		N	K			
6		P	K			
7		N	P	K		
8		O				
9		$N\frac{1}{2}$	P	K		
10		N_2	P	K		
11		N_3	P	K		
12		N	$P\frac{1}{2}$	K		
13		N	P_2	K		
14		N	P_3	K		
15		N	P	$K\frac{1}{2}$		
16		N	P	K_2		
17		N	P	K_3		
18	½	(N	P	K)		
19	1½	(N	P	K)		
20	2	(N	P	K)		
21	2½	(N	P	K)		
22		O				
23		N	P	K	Culture	Ridge to compare with level culture.
24		N	P	K	Rotation	1st year, cotton with oats and vetch in fall. 2d year, oats and vetch with peas in summer and oats and vetch in fall. 3d year, cotton, and then as in first year.
25		N	P	K	Rotation	Same as above, without the use of any nitrogen in fertilizer after first year.
26		N	P	K	Rotation	1st year, cotton with oats and vetch in fall. 2d year, oats and vetch with peas in summer and volunteer oats and vetch in in fall. 3d year, corn and peas, with oats and vetch in fall, then as in first year.
27		N	P	K		Deep application of fertilizer materials to compare with ordinary depth.

TABLE NO. III—RESULTS OBTAINED AT THE TARBORO TEST FARM, SEASON OF 1901.

FERTILIZATION AND YIELD OF COTTON IN POUNDS PER ONE-TENTH ACRE AND PER ACRE.

No. of Plat.	Fertilizer Applications.	Pounds Per Acre of—			Yield of Seed Cotton.		Increase Over Unfertilized Plat Per Acre.	Value of Increase at 3.2 Cents Per Pound.	Cost of Fertilizer Applications Per Acre.	Value of Increase Over Cost of Fertilizer Application.
		Acid Phosphate.	Kainit.	Cotton-seed Meal.	Per One-Tenth Acre.	Per Acre.				
1	N *	----	----	141.2	115.50	1,155.0	772.5	$24.72	$1.77	$22.95
2	P †	175.0	----	----	61.75	617.5	235.0	7.52	1.09	6.43
3	K †	----	72.4	----	58.00	580.0	197.5	6.32	0.47	5.85
4	N P	150.3	----	141.2	69.00	690.0	307.5	9.84	2.70	7.14
5	N K	----	52.6	141.2	59.50	595.0	212.5	6.80	2.11	4.71
6	P K	175.0	72.4	----	40.50	405.0	22.5	0.72	1 56	----
7	N P K	150.3	52.6	141.2	72.00	720.0	337.5	10.80	3.05	7.75
8	O (P) ‡	150.3	----	----	61.50	615.0	232.5	7.44	1.09	6.35
9	N½ P K	162.6	62.5	70.6	96.00	960.0	577.5	18.48	2.30	16.18
10	N_2 P K	125.6	32.8	282.4	106.25	1,062.5	680.0	21.76	4.53	17.23
11	N_3 P K	100.9	13.0	423.6	120.25	1,202.5	820.0	26.24	6.01	20.23
12	N P½ K	75.1	52.6	141.2	93.25	932.5	550.0	17.60	2.58	15.02
13	N P_2 K	300.6	52.6	141.2	96.25	962.5	580.0	18.56	3.99	14.57
14	N P_3 K	450.9	52.6	141.2	90.00	900.0	517.5	16.56	4.93	11.63
15	N P K½	150.3	26.3	141.2	96.50	965.0	582.5	18.64	2.88	15 76
16	N P K_2	150.3	105.2	141.2	82.28	822.8	440.3	14.09	3.39	10 70
17	N P K_3	150.3	157.8	141.2	71.00	710.0	327.5	10.48	3.73	6.75
18	½ (N P K)	75.1	26.3	70.6	42.75	427.5	45.0	1.44	1.52	----
19	1½ (N P K)	225.4	78.9	211.8	91.75	917.5	535.0	17.12	4.58	12.54

TABLE NO. III—Continued.

No. of Plat.	Fertilizer Applications.	Pounds Per Acre of—			Yield of Seed Cotton.		Increase Over Unfertilized Plats Per Acre.	Value of Increase at 3.2 Cents Per Pound.	Cost of Fertilizer Applications Per Acre.	Value of Increase Over Cost of Fertilizer Application.
		Acid Phosphate.	Kainit.	Cotton-seed Meal.	Per One-Tenth Acre.	Per Acre.				
20	2 (N P K)	300.6	105.2	282.4	80.00	800.0	417.5	$13.36	$6.10	$7.26
21	2½ (N P K)	375.7	131.5	353.0	103.50	1,035.0	652.5	20.88	7.63	13.25
22	O				38.25	382.5				
23	N P K §	150.3	52.6	141.2	82.50	825.0	442.5	14.16	3.05	11.11
24	Rotation ¶									
25	Rotation ¶									
26	Rotation ¶									
27	N P K ‖	150.3	52.6	141.2	76.00	760.0	377.5	12.08	3.05	9.03

* Better than average plats on account of previous fertilization.

† These two plats appear to be some better than others on account of previous manuring.

‡ Through mistake this plat received the application of acid phosphate.

§ Ridge to compare with level culture.

¶ These plats were planted in oats and vetch in the fall of 1900, followed by peas in summer of 1901, and again put in oats and vetch in the fall of 1901.

‖ Deep application of fertilizer materials to compare with ordinary depth in plat No. 7.

COMMENTS ON RESULTS.

It is undesirable, for reasons already given, to attempt to draw conclusions so early in the stage of the work. Some comments, however, are desirable and seem to be warranted by the results.

1. As was the case with corn, fertilizer applications paid better on cotton in the wet season of 1901 than they did in the dry one of 1900. This may have been due to the cotton on the unfertilized plats getting in 1900 the benefit of some unused fertilizer from the cotton crop of 1899. The fertilized plats, however, had the same opportunity. The unfertilized plats yielded more in 1900 than they did in 1901, and the increase due to fertilizer applications was, therefore, greater in 1901 than in 1900. With two exceptions, all the fertilizer applications more than paid for themselves in the year's work in the increased value of the product, the profits from some of the applications being quite large. The two plats where the increase due to fertilizer was less than the cost of the fertilizer, were No. 6, receiving only phosphoric acid and potash; and No. 18, receiving only one-half the normal quantity of fertilizer or 200 pounds per acre.

2. Comparison of yields on Plats 9 to 17, inclusive, shows that increased quantities of nitrogen not only gave larger yields, but also larger net profits than did similar increases of either phosphoric acid or potash, the phosphoric acid being more beneficial than the potash. The largest yield, as well as the largest net profit in crop (excepting Plat 1), came from Plat 11, which received the treble quantity of nitrogen as cotton-seed meal.

3. The results do not indicate that this soil, according to general belief, is more in need of potash than of phosphoric acid. In fact, the results point rather to the reverse, as is seen from the following comparisons:

	Application.	Yield Per Acre in Pounds.
Plat 2	Acid Phosphate	617.5
Plat 3	Kainit	580.0
Plat 4	Cotton-seed Meal Acid Phosphate	690.0
Plat 5	Cotton-seed Meal Kainit	595.0

The yields on Plats 13, 14, 16 and 17 also point in the same direction.

The past year, however, has been an unusual one in agriculural operations, and even had it been typical of general conditions, it would not be safe to attempt to make sweeping deductions from such limited data. Conclusions must await further work.

4. Increased applications of all materials did not give certain and proportionately greater crop yields, as is seen from the following:

	Fertilizer.	Yield.
Plat 7	400 pounds.	720 pounds.
Plat 19	600 do.	917 do.
Plat 20	800 do.	800 do.
Plat 21	1000 do.	1035 do.

5. Comparison of yields on Plat 7, subjected to level culture and producing at the rate of 720 pounds seed cotton per acre, and Plat 23, under ridge culture and yielding at the rate of 825 pounds of seed cotton per acre, is favorable to ridge culture the past wet season.

Considerable other cotton data obtained in the tests of 1901 are reserved for future use.

VARIETY TEST OF COTTON.

The fertilizer application per acre in this test was the normal one used for cotton, as follows:

N—10 pounds nitrogen	141.2 pounds cotton-seed meal.
P—28 pounds phosphoric acid	150.3 pounds acid phosphate.
K—10 pounds potash	52.6 pounds kainit.
Total	344.1 pounds per acre.

Cost of fertilizer application per acre, $3.05.

RESULTS OBTAINED IN VARIETY TEST OF COTTON.

TARBORO FARM.

Number 103¾-Foot Rows in Test.	Variety in Order of Productiveness.	Yield in Pounds Per Acre.
7	Russell's Big Roll	1,487
7	Culpepper's Improved	1,302
7	Peterkin's Improved	1,215
7	Strickland's Improved	1,142
7	Hawkins' Extra Prolific	1,053
7	Moss' Improved	999
7	Griffin's Improved	957

RED SPRINGS.

Rows 207½-Feet Long.		
7	Russell's Big Boll	496.3
7	Culpepper's Improved	477.0
7	Griffin's Improved	473.1
7	Hawkin's Extra Prolific	448.3
7	Peterkin's Improved	440.0
7	Moss' Improved	417.0
7	Sea Island	255.2

COMMENTS ON VARIETIES.

The varieties are arranged in order of productiveness at each place; they all received the same fertilizer application, and the cultivation was the same for all varieties at the same place.

The difference in the soil and season makes it necessary to compare the results with each other on the same farm, though the rank and order of productiveness should be considered at both places.

One row of each of the seven varieties of cotton followed each other and this order was repeated a sufficient number of times to give seven rows of each kind. The rows at Tarboro were 103¾ feet long, which gave something more than one-twentieth of an acre to each test; and at Red Springs the rows were 207½ feet long, giving over one-tenth of an acre to each kind of cotton. As was the case with corn, this variety test was also used to furnish data regarding planting in rows of different widths and varying distances in the rows. This data follows in the next table. It is desirable to continue work of this kind for some years before attempting to draw conclusions. The yields given in the tables make further comment unnecessary at this time.

SOURCE OF VARIETIES OF COTTON.

Culpepper's Improved, Alexander Seed Co., Augusta, Ga.
Peterkin's Improved, Alexander Seed Co., Augusta, Ga.
Moss' Improved, B. D. Moss, Norway, S. C.
Russell's Big Boll, G. F. Park, Alexander City, Ala.
Hawkins' Extra Prolific, B. W. Hawkins, Rome, Ga.
Griffin's Improved, John Griffin, Greenville, Miss.
Strickland's Improved, J. R. Strickland, Gardo, Ala.

DISTANCE TEST OF COTTON.

TARBORO FARM.

No. of Rows in each Test.	Width of Rows.	Distance of Planting in the Drill One Stalk to a Place.	Yield in Pounds Per Acre.
7	Three and one-half feet	Twelve inches	1,286
7	Three and one-half feet	Sixteen inches	1,384
7	Three and one-half feet	Twenty inches	1,410
7	Three and one-half feet	Twenty-four inches	1,063
7	Four feet	Twelve inches	964
7	Four feet	Twenty inches	893
	RED SPRINGS.		
7	Three and one-half feet	Twelve inches	284.0
7	Three and one-half feet	Sixteen inches	288.0
7	Three and one-half feet	Twenty inches	359.0
7	Three and one-half feet	Twenty-four inches	447.8
7	Four feet	Twelve inches	566.9
7	Four feet	Twenty inches	634.7

NOTE: Considerable quantities of Russell's Big Boll and Culpepper's Improved Seed have been carefully saved from cotton grown apart from each other and from other cotton.

COMMENTS ON DISTANCE TEST.

As previously stated, the variety test was used to furnish data regarding planting in rows of different widths and different distances in the rows, thinning to one stalk in a place. One row of each of the kinds of cotton followed the other, and the same order was repeated a sufficient number of times to give seven rows—one of each kind of cotton—to the test of each width of row and each distance in the row. This gave seven 103¾-foot rows at Tarboro, and seven 207½-foot rows at Red Springs to each test. It will require a number of repetitions of this test to arrive at a fair idea of the best width of rows and distance in rows for planting cotton on the types of soil on which these tests were made. This will likely vary somewhat with the different kinds of cotton, and data of this nature was furnished by the present test, but will be reserved for future use.

III.

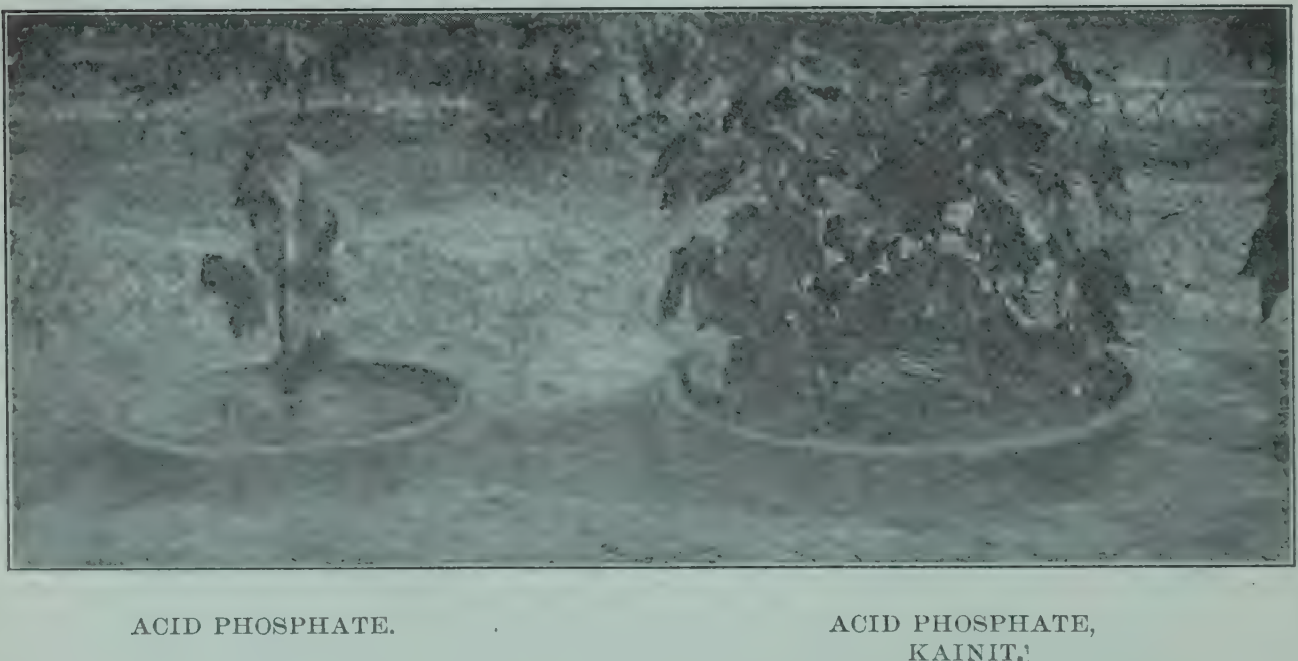
EXPERIMENTS ON BLACK OR POCOSIN SOILS AND METHODS OF TREATING THEM.

In the eastern part of the State there are considerable areas of black soils, which contain large amounts of vegetable matter. They are generally known locally as "Pocosin," and are, as a rule, quite productive when first cleared, but often after a few years' cultivation get in such condition that they will not grow a crop of any kind. To all outward appearances these are rich and valuable lands. Frequent complaints come to the Department regarding the non-productiveness of this type of land, and it is known that considerable areas have been abandoned. During the past year and a half analyses have been made in the laboratory of quite a number of samples of this kind from different parts of the east, in connection with a general and systematic study that is being made of the soils of the State, and much valuable data regarding this particular kind of soil, as well as of other soils, are being obtained. Last spring we suggested to a number of farmers, on basis of the analyses, observations made in person in the field, and information from farmers, a method of treatment for this type of land.

To test the question ourselves, experiments on a small scale were made at the Tarboro farm the past year, using a black soil which has been long in cultivation, but which had not produced a crop to amount to anything for several years past. Twenty-four-inch tiling were put in the ground and filled with this black soil, six being used for the test with corn and six with cotton. Unfortunately the experiment with corn was lost. The cuts made from photographs taken of the cotton on September 7th, when it had practically completed its growth, show the effect of the different applications. No attempt was made to estimate the comparative yields on such a small area. The effect of lime is seen to have been quite marked, potash as kainit was beneficial, and acid phosphate did some good. Nitrogen in cotton-seed meal did not seem to add anything to the growth of the cotton on this soil. Farmers who tried lime, acid phosphate, and kainit on a considerable area, according to the plan given below, report results corresponding with our tests. The experiments on this subject will be continued.

EFFECT OF FERTILIZERS AND LIME ON BLACK OR "POCOSIN" SOIL.

NOTHING. LIME.



ACID PHOSPHATE. ACID PHOSPHATE, KAINIT.

TREATMENT OF NON-PRODUCTIVE BLACK SOILS.

These soils contain a great deal of vegetable matter and are acid, or sour. Lime will correct the sourness. They are also deficient in potash and phosphoric acid, but contain (for soils) large amounts of nitrogen-yielding materials. With these facts in mind, the following treatment has been suggested and used with good results:

Apply slaked lime at the rate of about 1,000 pounds per acre broadcast in the fall, winter, or early spring—the sooner the better—as it requires some time for the lime to get well into the soil and correct its sourness. It is better to do this before breaking the land for crops. At planting apply in the drill, for corn, 100 to 200 pounds per acre, and for cotton, 200 to 400 pounds per acre of the following mixture:

Acid Phosphate	200 pounds.
Kainit	100 pounds.

The Department should be pleased to have reports from anyone using this treatment, or any other treatment on this kind of land, with their results and suggestions.

IV.

FERTILIZATION AND CULTIVATION OF CORN AND COTTON.

CORN.

Culture.—It unquestionably pays well to thoroughly break and broadcast harrow land for corn. Using a two-horse plow and running it 8 to 10 inches deep, and afterwards harrowing with large smoothing harrow, puts the land in nice condition. It is also well to run harrow across corn rows about the time the plants are coming up, and even after they are several inches high, slanting the teeth of the harrow backward. Harrowing in this way saves after-cultivation, and is a quick way of getting over the land. The land being thoroughly broken before the corn is put in the ground, only shallow, level cultivation with some one of the considerable number of good cultivators need be given during the growing season. The one-horse cultivators cover corn rows in two to three furrows, and the two-horse ones at a single trip. The cultivation should be frequent—about every ten days—and if possible just after rains, so as to break any crust formed by showers, leaving a dust mulch to retard the loss of moisture added to the soil in the previous rains. Toward the end of the growing season the cultivators should only be run one to one and a half inches deep, so as to disturb as little as possible the roots of the plants, which, by that time, are well into the middle of the rows.

Fertilizers for Corn.—The experimental work on the sandy soils of the east, report of which for one year has been made on the preceding pages, has not been conducted long enough to justify attempts to draw definite conclusions as to the best amounts and proportions of nitrogen, phosphoric acid and potash for corn. The results of the two years' tests and those in other States on similar soils justify the suggestion of the following formulas as ones that will give good results on corn:

ACID PHOSPHATE,
KAINIT,
LIME.

ACID PHOSPHATE, KAINIT,
COTTON-SEED MEAL,
LIME.

FOR CORN ON LAND IN FAIR CONDITION.

No. 1—

Acid Phosphate, 14 per cent phosphoric acid	875 pounds
Cotton-seed Meal, 6.61 per cent nitrogen	950 pounds
Kainit, 12½ per cent potash	175 pounds
	2,000 pounds

This mixture will contain, available phosphoric acid, 7.3 per cent; potash, 1.8 per cent; nitrogen, 3.13 per cent (equal to ammonia 3.8 per cent).

No. 2—

Acid Phosphate	1,000 pounds
Fish Scrap, 8¼ per cent nitrogen	750 pounds
Kainit	250 pounds
	2,000 pounds

This mixture will contain, available phosphoric acid, 8.1 per cent; potash, 1.6 per cent; nitrogen, 3.1 per cent (equal to ammonia 3.76 per cent).

No. 3.—

Acid Phosphate	1,000 pounds
Fish Scrap	920 pounds
Muriate of Potash, 50 per cent potash	80 pounds
	2,000 pounds

This mixture is more concentrated than Nos. 1 and 2, on account of the use of a higher grade potash material, muriate of potash, and will contain, available phosphoric acid, 8.4 per cent; potash, 2 per cent; nitrogen, 3.8 per cent (equal to ammonia 4.6 per cent).

No. 4—

Acid Phosphate	950 pounds
Cotton-seed Meal	1,000 pounds
Muriate of Potash	50 pounds
	2,000 pounds

This mixture will contain, available phosphoric acid, 7.9 per cent; potash, 2.0 per cent; nitrogen, 3.3 per cent (equal to ammonia 4.0 per cent).

No. 5—

Acid Phosphate	1,250 pounds
Dried Blood, 13 per cent nitrogen	650 pounds
Muriate of Potash	100 pounds
	2,000 pounds

This mixture will contain, available phosphoric acid, 8.7 per cent; potash, 2.5 per cent; nitrogen, 4.3 per cent (equal to ammonia 5.2 per cent).

Cotton Seed.—Cotton seed may replace the meal in formulas containing meal by allowing 2¼ pounds of seed for one of meal.

Nitrate of Soda.—In ordinary seasons it generally pays to apply one-half the nitrogen as nitrate of soda to corn, from the first to the fifteenth of June. If this is to be done the materials furnishing nitrogen in the foregoing formulas should be reduced accordingly. One pound of nitrate of soda contains as much nitrogen as 2.2 pounds of cotton-seed meal, 2 pounds of fish scrap, or 1.2 pounds of dried blood.

Application of Fertilizer to Corn.—Fertilizers for corn should be applied in the drill, at or just before planting, except nitrate of soda, which should be distributed along the side of the row, dropped opposite the stalks, or drilled on a "bone" in the middle of the row, and afterwards throwing this "bone" out. The nitrate should go on when the plants seem in need of fertilizer, but not later than the latter part of June. It is not considered good practice to use nitrate of soda in mixtures for corn to be applied at or before planting, especially on sandy lands, as the danger of loss from leaching out before the plant can use it is too great. The quantities of fertilizers used for corn are 100 to 300 pounds per acre.

FERTILIZERS FOR CORN FOLLOWING PEAS, ETC.

The best and most profitable yields of corn in our experimental work were where the corn followed velvet beans and other leguminous crops. These crops, with acid phosphate and kainit, or some other potash salt, are the best previous treatment and fertilization for corn. Where light crops of peas have been grown in corn, or cut from the land and the stubble left, it would be safest to add some nitrogen in the fertilizer mixture. In cases of this kind it is suggested that the nitrogen-furnishing material in any of the preceding formulas be reduced one-half. Where corn is to follow good crops of velvet beans, peas, or soja beans, especially where the entire crops have been left on the soil, no further application of nitrogen need be made, but it is advised that about 200 pounds per acre of the following mixture, in the drill, be used just before planting:

Acid Phosphate	200 pounds
Kainit	100 pounds

COTTON.

Culture.—The remarks regarding the preparation and cultivation of corn also apply with equal force to cotton, unless it be the part regarding breaking the land well before planting. Some doubt the necessity of this for cotton. Cotton is generally grown on ridges. This is necessary on wet soils, but on all fairly well-drained upland and sandy soils, we are convinced that level and frequent shallow cultivation, as was indicated for corn, is the best and most economical method to follow in growing cotton. Ridge culture may give better results in very wet years, but taking the seasons as they come the advantage will lie, we think, with flat culture.

Fertilizers for Cotton.—The preliminary remarks regarding fertilizers for corn also apply to cotton, the following formulas being offered tentatively and as the result of our best judgment, after studying the best obtainable data on the subject:

No. 1—

Acid Phosphate, 14 per cent phosphoric acid	900 pounds
Cotton-seed Meal, 6.6 per cent nitrogen	800 pounds
Kainit, 12½ per cent potash	300 pounds
	2,000 pounds

This mixture will contain, available phosphoric acid, 7.3 per cent; potash, 2.5 per cent; nitrogen, 2.64 per cent (equal to ammonia 3.20 per cent).

No. 2—

Acid Phosphate	950 pounds
Fish Scrap, 8¼ per cent nitrogen	650 pounds
Kainit	400 pounds
	2,000 pounds

This mixture will contain, available phosphoric acid, 7.6 per cent; potash, 2.5 per cent; nitrogen, 2.68 per cent (equal to ammonia 3.25 per cent).

No. 3—

Acid Phosphate	1,000 pounds
Cotton-seed Meal	925 pounds
Muriate of Potash, 50 per cent potash	75 pounds
	2,000 pounds

This mixture will contain, available phosphoric acid, 8.1 per cent; potash, 2.5 per cent; nitrogen, 3.0 per cent (equal to ammonia 3.64 per cent).

No. 4—

Acid Phosphate	1,075 pounds
Fish Scrap, 8¼ per cent nitrogen	800 pounds
Muriate of Potash	125 pounds
	2,000 pounds

This mixture will contain, available phosphoric, 8.7 per cent; potash, 3.1 per cent; nitrogen, 3.3 per cent (equal to ammonia 4.0 per cent).

Numbers 3 and 4 are more concentrated mixtures than 1 or 2, on account of the use of the high-grade muriate of potash instead of kainit.

No. 5—

Acid Phosphate	1,250 pounds
Dried Blood, 13 per cent nitrogen	600 pounds
Muriate of Potash	150 pounds
	2,000 pounds

This mixture will contain, available phosphoric acid, 8.8 per cent; potash, 3.8 per cent; nitrogen, 3.9 per cent (equal to ammonia 4.74 per cent).

Cotton Seed and Nitrate of Soda.—The remarks under corn regarding these

two materials apply also to cotton, as do the suggestions concerning the change in the quantity of nitrogen supplying materials in the formulas should cotton follow peas or other leguminous crops.

Applications of Fertilizers to Cotton.—The fertilizer should be applied in the drill at or just before planting, except nitrate of soda. When used this should be distributed along the side or sides of the row, or on a "bone" in the middle of the row, which is to be thrown out later. The suggestions regarding the inadvisability of using the very soluble nitrate of soda in mixed fertilizers for corn apply with equal force to cotton. When used, especially on sandy lands, it should be as a second application from the middle of June to the first of July.

The quantity of fertilizer used on cotton varies from 200 to 600, and sometimes even 800 or 1,000 pounds to the acre; 400 pounds is the more common quantity used, though some farmers apply 500 and 600 pounds with profitable results.

V.

COMPOST FORMULAS.

Compost for General Use.—Frequent requests are made for compost formulas and the following one with barnyard manure, rich dirt, or wood's mould, or all, and acid phosphate and kainit is well suited for general use:

Barnyard manure, rich dirt or wood's mould	1,750 pounds
Acid Phosphate	200 pounds
Kainit	50 pounds
	2,000 pounds

With average barnyard manure the above compost would contain phosphoric acid, 1.7 per cent; potash, .7 per cent, and ammonia, .6 per cent. One ton of this compost is worth between 500 and 600 pounds of the average fertilizer containing 8 per cent of available phosphoric acid, 2 per cent of potash, and 2 per cent of ammonia. It should be applied at the rate of 600 to 1,600 pounds per acre in the drill, 1,400 pounds of the compost being about equal to an application of 400 pounds of the 8-2-2 fertilizer.

The compost may be made under shelter or out of doors. In either case select a place where the soil is compact and arrange it so that the water that may run through the heap will not drain from it. Put down the materials in alternate layers; first, a layer 3 to 6 inches thick, according to the size of the compost to be made, of the manure, wood's mould, or rich dirt, then sprinkle upon this layers of acid phosphate and kainit, and continue in this way to put down alternate layers of the materials till the compost is complete. If dry, the manure, mould, etc., should be moistened by sprinkling with water and the heap should be brought to a conical shape, covered with dirt, preferably rich dirt, and thoroughly compacted to prevent undue entrance of air, which brings about heating and injurious fermentation of the heap. The compost must be watched, and if it becomes hot, a hole should be made in the side and toward the top and water poured in to cool it. This is likely to be the case if made under shelter, while out of doors in the winter and early spring the

rains are apt to be sufficient to keep it moist, but here there is danger of loss, especially of the very soluble potash and phosphoric acid, from leaching, and the heaps made out of doors need careful watching to see that they do not get too hot just after making and between rains, and more especially to see that they are thoroughly covered with dirt and compacted, so as to make the water run mostly off the sides instead of through the heap and draining off with the most valuable part of the manure. When convenient it would seem best to make the heap where it can have some protection from frequent and heavy rains and moisten when necessary to keep from becoming too hot. The heap should remain 30 to 60 days, and may stay longer. Before using it should be thoroughly cut up and mixed with hoes and shovels. If the manure, wood's mould and dirt are reasonably free from litter and trash, the mixture may be put through a sand screen and be in condition to drill as other fertilizers are. This will require care in selecting the manure, mould and dirt.

Unquestionably there is great advantage, if it is not indeed an absolute necessity, to save scrupulously all the manure and other waste material on and around the farm, to assist in maintaining or increasing its productiveness. One way to do this is to use the compost in some way similar to that suggested in the foregoing. Another and perhaps somewhat cheaper, unless the compost is made at a time when the farm labor is not profitably occupied with other things, is to apply the manure and wood's mould, etc., broadcast, where there are large quantities of them, or in the drill, when the amounts are limited and less than 1,500 to 2,000 pounds to the acre, and drill the acid phosphate and kainit or other materials on them. This saves the cost of mixing. Each plan has its advantages and each farmer can decide for himself which best suits his individual case, and which will enable him to save to best advantage these exceedingly important and valuable fertilizer materials on and about the farm, and which go to waste, or partial waste, in far too many cases.

Compost With Cotton Seed.—Frequently cotton seed are used as fertilizer. One difficulty in the way of their use is the killing of them, so as to prevent them from sprouting and growing. A common custom is to pile them in the field early in the spring and allow them to become wet and afterwards heat. They are then put in the drill as other fertilizers, or sometimes broadcasted. They are also killed by composting, and the following compost with cotton seed is a well-balanced and rich one for general farm crops:

Cotton Seed, 13 1-3 bushels	400 pounds
Acid Phosphate	300 pounds
Kainit	75 pounds
Barnyard manure, etc.	1,225 pounds
	2,000 pounds

This compost will contain phosphoric acid, 2.6 per cent; potash, .9 per cent; ammonia, 1.1 per cent. One ton of it is worth between 800 and 900 pounds of the average fertilizer containing 8 per cent available phosphoric acid, 2 per cent ammonia, 2 per cent potash, and a good application for cotton would be 500 to 1,000 pounds in the drill and for corn 400 to 800 pounds in the drill.

Compost With Cotton-seed Meal.—Cotton-seed meal may replace the seed in the preceding compost. In fact, it is much better to use some of the insoluble forms of nitrogen, or ammonia, in composts rather than nitrate of soda or sulphate of ammonia, which are already in easily soluble condition and ready to feed plants. Besides, there is not the same danger of loss when materials like cotton seed, cotton-seed meal, etc., are used, as when nitrate of soda, and sulphate of ammonia are employed. The following compost with cotton-seed meal is some richer than the one with seed already given:

Cotton-seed Meal	200 pounds
Acid Phosphate	325 pounds
Kainit	100 pounds
Barnyard Manure, etc.	1,375 pounds
	2,000 pounds

This mixture will contain, phosphoric acid, 2.8 per cent; potash, 1.0 per cent; ammonia, 1.2 per cent. One ton of this is equal in fertilizing value to about one-half ton of a mixed fertilizer containing 8 per cent available phosphoric acid, 2 per cent ammonia, and 2 per cent potash. A good application of it for cotton would be 400 to 800 pounds in the drill, and for corn, 300 to 600 pounds in the drill.

Use of Lime in the Compost.—Where lime is used at all in the making of compost, it should not be put in contact with either the barnyard manure or acid phosphate, as it has an injurious action on both of these, endangering the loss of ammonia from the manure by setting it free and enabling it to pass off in the air, and rendering the phosphoric acid of the acid phosphate insoluble. Where sour muck or black soil is used the lime mixed with these would correct the acidity or sourness and be beneficial.

LIPPS' PATENT "PROCESS OF MANUFACTURING COMPOST FERTILIZERS."

For the past two years or more a process for making compost has been offered to the farmers of the State for $3.00 per farm right. In the January (1901) BULLETIN of the Department an article regarding this process, and entitled "Lipps' Manual of Secret Processes for the Manufacture of Home-made Fertilizers," was published, giving, after a careful study of the materials and methods of mixing and handling, our opinion of the value of the product. On February 1, 1902, another article on the same subject was addressed to and published in the *Progressive Farmer*, in response to a very large number of enquiries from farmers, regarding the Lipps Process. In both of these communications it was stated that there was nothing new in any of the materials employed in the Lipps Process, and further, that there was nothing in the method of treating the materials, as given by Mr. Lipps, that added value to them. To these articles the author of the process, Mr. M. M. Lipps, has replied, insinuating that I am either ignorant, incompetent, and controlled by certain financial interests, or else want to give his process a "black eye" be-

cause of "envy" or "jealousy." Mr. Lipps advertises himself as "a noted chemist." Men of scientific attainments usually support positions taken by them with facts and not abuse. We shall continue to use simply facts in dealing with this question, leaving it with those who know us better than Mr. Lipps, to decide as to the question of competency and honesty. Below is a copy of the process, as obtained from the Patent Office, together with comments in parenthesis, and further on a summary statement of our reasons for taking the position we have regarding it:

"UNITED STATES PATENT OFFICE.

MICHAEL M. LIPPS, OF BLUFF CITY, TENNESSEE.

METHOD OF MAKING FERTILIZERS.

"Specification forming part of Letters Patent No. 686,744, dated November 19, 1901. Application filed January 31, 1901. Serial No. 45,513. (No specimens.)

"*To all whom it may concern:*

"Be it known, that I, Michael M. Lipps, a citizen of the United States, residing at Bluff City, in the county of Sullivan and State of Tennessee, have invented a new and useful Process of Manufacturing Compost Fertilizers, of which the following is a specification:

"This invention relates to improvements in processes for the manufacture of compost fertilizers, and has for its object the provision of a new process for the manufacture of a fertilizer from the manure of the barnyard in connection with certain cheap chemicals hereinafter named.

"The process has for its further object the production of a fertilizer in which the fibrous material is entirely broken up and disintegrated, so that all the plant nourishment is released therefrom, but is retained in the compound in a condition available to the plant.

"A still further object is to provide a process which can be readily carried out by any farmer upon his own ground, and which embodies chemicals that are exceedingly inexpensive and readily obtainable. Futhermore, a fertilizer is produced which is in a finely-powdered condition, and unlike all others of this class, which, I am aware, may be fed, together with the grain, through the ordinary grain-drill, such as is used in the planting of wheat and grain of a similar character. It will also retain its nourishing elements for an indefinite period and can thus be stored away—a valuable advantage over those which, when made, must necessarily be used immediately. (There is absolutely no reason why this material should keep better than composts made by other and well-known formulas, such as have been given in the *Bulletins* of the Department of Agriculture and Experiment Station.)*

"In carry out the present process, the ingredients preferably employed are manure, earth, sulfate or ammonia, chlorid of sodium, acid phosphate, lime, nitrate of soda, and muriate of potash. (These materials are well known to both farmers and fertilizer manufacturers. The newness can not reside in them.)

*The comments thus ( ) enclosed are our own.

"In the manufacture of a ton of this fertilizer, about two parts of manure and about one part of dirt, together with chemicals in about the following proportions, are employed: Fourteen per cent acid phosphate, one hundred pounds; lime, one hundred pounds; muriate of potash, fifty pounds; nitrate of soda (saltpeter), twenty-five pounds; chlorid of sodium (salt), twenty-five pounds; sulfate of ammonia, five pounds.

"In carrying out the process a box or vat seven feet long, three feet wide, and two feet in depth, containing about forty-two cubic feet, is employed. By experiment it has been found that this box will hold about one ton of the compost made by my process. Of course it will be understood that neither the size nor shape of the box or vat has any connection with the process, the above dimensions being given merely for the purpose of convenience to those using the process. It is also further obvious that this process might be carried out without the use of a box or vat; but it is preferable to use one, as the results obtained thereby are more satisfactory. When a large amount of the compost is to be made, it will be obvious that a larger box or vat will be used.

"In carrying out the process a quantity of manure is taken and reduced to a well-chopped condition, free from lumps. A sufficient quantity of this finely-chopped material is then placed in a layer in the box or vat to the depth of about two inches. On top of this layer of manure is sprinkled or sifted about one-half of a pound of sulfate of ammonia, this ammonia being used for its plant-food value and to assist in balancing the fertilizer. On top of this layer or sprinkling of ammonia there is sifted or otherwise spread about two and one-half pounds of chlorid of sodium. This chlorid of sodium is employed for the purpose of drawing to and concentrating moisture in the mixture to aid in its decomposition. Furthermore, the chlorid contained therein is beneficial in preventing rust from attacking the plant-life and also has the effect of killing or preventing grubs or other insects which attack the roots of young plants. On the chlorid of sodium is then sprinkled or spread a layer containing about ten pounds of acid phosphate. This phosphate is used for its phosphoric acid, that is a well-known plant-food (yes; and so are all the others, except common salt, well-known plant-food), and also for the sulfuric acid, which decomposes and disintegrates the woody or vegetable fiber of the manure, thus releasing the plant-food it contains, which is made immediately available. (Rarely does well-made acid phosphate contain an appreciable amount of free sulphuric acid, manufacturers being careful to avoid its presence, as it makes the acid phosphate sticky and difficult to handle. Granting, however, that it is present, a better way of neutralizing and rendering it ineffective could not well be devised than by placing upon the acid phosphate the nice little layer of lime, which follows.) About five pounds of lime is sprinkled or sifted on top of the acid phosphate in the box or vat. (In making acid phosphate, lime is taken from the phosphate rock to increase the value of the product for plant-food; here lime is added for the same purpose. This will be difficult for even one who knows no chemistry to reconcile.) This lime is used to assist in the decomposition of the manure, and also to assist in retaining in the compound the valuable gaseous ammonia released by the other ingredients. (This is the brightest idea to be found in this most remarkable invention. In all laboratories lime is used to set free and drive off ammonia. Here it is used to hold it—something that is absolutely

impossible. Any student in chemistry knows that the claim made here for the action of lime in this mixture is incorrect.)

"The lime is also, as is well known, a very important element in plant-life, and is necessary to the full development thereof. After the first layer of manure has been treated as above described, another layer is placed in the box or vat and treated in the same manner, and the operation is repeated until the box or vat is about half full, the mixture having been thoroughly packed or compressed at about every second layer of manure that has been placed in the box for the purpose of preventing an excess of air remaining therein and causing a too-rapid fermentation, with a consequent high temperature and burning of the plant-food. When a sufficient number of layers of the composition have been placed in the vat, a layer of dirt, preferably rich loam, to the depth of one inch is placed over the whole. The dirt is used to give weight and body to the mass (an examination of the composition of this mixture, given below, will show that it is mostly 'mass'), to arrest and hold the gases that arise (which the lime was to hold and will not; they will undoubtedly rise and need somthing to hold them) from the manure layers beneath, and for the plant-food elements it contains. About two pounds of nitrate of soda is spread evenly over this loam, and about four pounds of muriate of potash is spread over the nitrate of soda. On top of the potash is then spread or sprinkled about four pounds of lime. The lime is used in the dirt as a drier, and also to catch and hold any gases that the dirt might fail to absorb. (Salt, and along with it lime, was used in one part of this interesting mixture to make it wet; here lime is used to make it dry and hold the gases. It is not one of the characteristics of gaseous ammonia, the only valuable gas in this mixture, to hang on to dry things.) The nitrate of soda and muriate of potash are used in the compound for their plant-food value and for the purpose of keeping the fertilizer balanced. (For general crops, the mixture is about as badly balanced as could be well imagined, as any farmer will see by reference to its composition below.) The above operation is repeated as often as may be desired, or until the box or vat is filled. The compound is then allowed to stand for a period of from sixty to ninety days, according to the temperature, after which the compost may be broken into, and either used as a fertilizer immediately, or may be put away in bags or barrels for future use. If the compost is wet when broken into, it is allowed to air-dry a few days and then is worked thoroughly. If it is desired to use the compost in a drill, it is advisable to sift the same to clear it of lumps. (Any farmer can drill his manure, or anything else, if he will go to the trouble of cutting up and breaking the lumps, and drying and sifting, as is required in this case.) After being sifted, it should be allowed to stand and be thoroughly dried by the air.

"There are several important advantages over this process. In the first place, the vegetable and fibrous structure of the manure is completely broken down and disintegrated, so that the important and valuable elements that go to make up the plant-food are released. At the same time these elements do not escape from the mass, but are taken up by and incorporated with the other ingredients. By this process also complete nitrification takes place while the materials are in the above-described relation. (All of which is not so, as anyone who is at all familiar with even the elementary principles of

nitrification and bacteriology knows that the conditions here—a compact heap, with absence or scant supply of air and abundance of vegetable matter, as in the manure—are most favorable for the opposite process of dentrification or destruction of the valuable nitrate of soda, unwisely added, and any of the nitrogen of the manure that may have been converted into this nitrate form, liberating and allowing them to pass off into the air in the worthless form, to ordinary crops, of free nitrogen, or else as ammonia gas, to be brought down in some chance shower to fertilize some distant field, or else add to the riches of the ocean.) For this reason, therefore, the fertilizer after the process is finished can be kept for an indefinite length of time, and does not have to be immediately placed in the soil, as do those in which the process has only been begun, and the valuable properties would be lost entirely if not immediately applied. (This comparison, contention, and claim can not be so, and is not.) A further advantage resides in the fact that the resultant fertilizer is in the form of a dry powder, which can thus be used in an ordinary drill. So far as I am aware ordinary manure has never been reduced to this form heretofore. Finally, the process is exceedingly simple, the ingredients inexpensive and readily obtainable, and all contain elements which in themselves are excellent plant-food. (How about the salt?)

"Should it be desired to hasten the process and reduce the number of days the compound must stand, it is only necessary to mix twelve pounds of commercial sulfuric acid and ten gallons of water and sprinkle each layer of manure with about a gallon of the same before applying the other chemicals. This will hasten the decomposition of the manure, so that the resultant fertilizer will be ready for use in about two weeks. Under ordinary conditions, however, it is unnecessary to use this last ingredient, and as it adds to the expense and is rather dangerous to handle, it is preferably not employed. (Sulphuric acid has been used before for cutting up or preserving manure, but for the very sensible reasons given above, it is not often recommended for use on the farm.)

From the foregoing it is thought that the construction, operation, and many advantages of the herein-described invention will be apparent to those skilled in the art without further description, and it will be understood that changes in the proportions of the ingredients and their relation to each other may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention, provided such changes are within the scope of the appended claims.

"Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

"1. The herein-described process consisting in spreading a quantity of manure in a layer, placing thereon chlorid of sodium and acid phosphate, covering the same with earth and lime, and allowing the mass to stand for a determinate period.

"2. The herein-described process, consisting first in taking a quantity of finely-divided manure and spreading the same in a layer, and successively spreading or sifting thereover quantities of sulphate of ammonia, chloride of sodium, acid phosphate and lime, and repeating said operation until a plurality of layers have been formed; secondly, spreading over this composi-

tion a suitable layer of earth, upon which is spread nitrate of soda, muriate of potash and lime, in succession; and thirdly, allowing the whole to stand to effect the chemical changes and the decomposition of the fibrous material of the constituent elements.

"3. The herein-described process, consisting first in reducing ordinary barnyard manure to a finely-divided condition, spreading it in a layer, and sprinkling successively over this layer a quantity of sulphate of ammonia, a quantity of chlorid of sodium, a quantity of acid phosphate and a quantity of lime; secondly, taking a quantity of earth and spreading the same over the top of the lime and spreading successively over this layer of earth a quantity of nitrate of soda, muriate of potash, and lime; and, thirdly, allowing the resulting mixture to stand for a period.

"4. The herein-described process consisting first in reducing ordinary barnyard manure to a finely-divided condition, spreading it in a layer and sprinking over this layer successively, a quantity of sulfate of ammonia, chlorid of sodium, acid phosphate, and lime; secondly, taking a quantity of earth and spreading the same over the top of the lime and spreading successively a quantity of nitrate of soda, muriate of potash and lime over said earth; thirdly, allowing the resulting mixture to stand for a given period, and, lastly, chopping the compound or compost and sifting the same.

"In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

"MICHAEL M. LIPPS."

"Witnesses:
"ROBERT W. RUSH,
"FRED. H. WEBB."

Having recorded in the several parentheses above specific statements regarding this invention, I now wish to summarize and add some further data in support of my position.

1. There is nothing new or ingenious in the materials employed, manure, dirt, acid phosphate, muriate of potash, nitrate of soda, sulphate of ammonia, lime and salt, being familiar and well-known substances. Except lime and salt, these materials are, and have been, in frequent, if not constant, use for years by farmers and fertilizer manufacturers. Salt is not plant-food and the lime as used works far greater injury in driving off the ammonia from the manure than it does in pulverizing the manure. The main value of the manure resting in its ammonia, it is mistaken economy to throw a part, at least, of it away, merely for the sake of getting the less valuable residue in condition to be put through a grain-drill.

2. Great stress is laid on the arrangement of the materials, it being claimed that this is such as to bring about complete disintegration of the manure with the release and retention of the valuable plant-food in the compost heap. Not only is this not so, but the arrangement, as already stated in the comments, is *very* undesirable, in that the lime is placed where it will do the greatest injury in driving off the ammonia (let any farmer who has a son in any of our schools, taking even elementary chemistry, put this question to him), and likely also injuriously effecting the acid phosphate by mak-

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ing it less soluble and valuable as plant food. The nitrate of soda is also in danger of being lost, not because of being put in the worst place, but because anywhere in the entire mixture is bad for it. The chief object in composting is to protect and render better fit for plant food the nitrogen (or ammonia) compounds. The Lipps process helps to defeat this aim, and if the compost does not go wrong, it is certainly not its fault, as the temptation is great.

3. But the proportions of these materials are said to be such as to make a specially "well-balanced" fertilizer. For the good of the mixture it is to be hoped that there is something in this contention. Let us examine. The constituents which give to a fertilizer mixture its value are ammonia, phosphoric acid and potash. In what amounts and proportions do these enter into the Lipps Compost? Using his formula we have:

			Contains—		
			Phos. Acid. Pounds.	Potash. Pounds.	Ammonia. Pounds.
Acid Phosphate, 14 per cent	100	pounds	14	-----	-----
Muriate of Potash	50	do	-----	25	-----
Nitrate of Soda	25	do	-----	-----	4.75
Ammonium Sulphate	5	do	-----	-----	1.25
Salt	25	do	-----	-----	-----
Lime	100	do	-----	-----	-----
Total in Fertilizer Materials	305	do	14	25.0	6.00
Average Manure*	1,695	do	5.9	6.8	10.2
Total, one ton	2,000	do	19.9	31.8	16.2
Percentage Composition			.99	1.59	.81

There were, therefore, put into the mixture, phosphoric acid, .99 per cent; potash, 1.59 per cent; and ammonia, .81 per cent, or one and one-half times as much potash as phosphoric acid, and twice as much as ammonia. What farmer would, knowingly, use such a proportioned fertilizer on cotton or corn, expecting to get the best returns? It is not a "well-balanced" fertilizer for general crops, experiments conducted for a series of years having shown that nearer equal quantities of potash and ammonia and two to two and one-half times these amounts of phosphoric acid on ordinary soils give best results on cotton. Other examples, based on field experiments, might be given.

4. There being nothing in the materials employed to justify the claim to a "wonderful scientific discovery," the arrangement of them being bad, and the proportions, if possible, worse, one would be disposed to look upon the whole thing as a tremendous joke, thinking that some special examiner, possibly on the first day of April, wishing to eclipse all previous records of fun-making, set upon this compost formula as one that would be safe from all rivals. There is good ground for such a view, as is evidenced in the unquestionable mistakes regarding the chemistry of the process, and other amusing things which are more particularly instanced in the addition of sulphuric acid in acid phosphate to "disintegrate" the fiber of the manure, and then the quick neutralization of this with a nice little layer of lime; the addition of a nitrate in one part of the process, which it is proposed that bacteria shall produce in another, and the use of salt to make the heap wet, and lime to make it dry. All of this brings forcibly to mind the Englishman's descrip-

* Which makes a better showing than if one-third dirt were employed.

tion, for which I claim no originality, of the American's habits at the bar. "American people," says he, "are awfully funny, don't you know; they first put in a little whiskey, you know, to make it strong, and then some water to make it weak, and then some sugar to make it sweet, then some lemon to make it sour; then they hold it up, don't you know, in their hands and say 'Here's looking at you,' then they drink it themselves."

But the patentee evidently regards this as a serious matter, judging from the way he writes in the papers. He questions my infallibility—a quality to which I have never, and shall never, make claim; puts himself in the hands of the Patent Office, and tries to convey the idea that the mere fact that the Patent Office has granted him a patent is sufficient evidence of the value of his product. As a matter of fact, the Patent Office does not guarantee either the newness or value of any patent, as is shown by the following statement from the legal advisers of the Department of Agriculture:

"RALEIGH, N. C., February 22, 1902.

"MR. B. W. KILGORE, *State Chemist, Raleigh, N. C.*

"DEAR SIR:—We have looked into the question of the rights of the patentee of a formula for making a fertilizer, as requested, and the law is as follows:

"There is a presumption from the issue of a patent—

"1. That the methods or ideas were new.

"2. That they were useful.

"3. That they required invention, and that they were the invention of the patentee; but this presumption may be disproved, and the patent shown to be invalid for want of one or more of the above requisites. The government does not *guarantee* the patent. The patent, supposing it to be valid, gives the patentee an exclusive right for 17 years, 'to make, use and vend the invention or discovery throughout the United States'; but we find no law for keeping *formulas* or methods secret. On the contrary, they should be known, so that vendees may be informed whether the article he proposes to buy is valuable.

"Yours truly, (Signed) BATTLE & MORDECAI."

5. The changes which take place in the Lipps', or any other compost heap, are chemical and bacteriological, and, in further support of our position, and in answer to the patentee's charge (in the press of the State), that I am, through "envy" and "jealousy," trying to give his process "a black eye," I submit below the opinions each of a prominent chemist and bacteriologist regarding the Lipps Process, as follows:

"AGRICULTURAL EXPERIMENT STATION
OF THE RHODE ISLAND COLLEGE OF
AGRICULTURE AND MECHANIC ARTS,

"KINGSTON, R. I., February 27, 1902.

"Prof. B. W. KILGORE, *State Chemist and Director Agricultural Experiment Station, Raleigh, N. C.*

"DEAR SIR:—Yours of the 25th inst., enclosing a copy of specifications forming a part of Letters Patent, No. 686,744, dated November 19, 1901, rela-

ting to a method of making fertilizers, was duly received. You ask me my opinion in relation to "materials employed and their arrangement," in comparison with such formulas as I should recommend in this State. Regarding the same, I will say that it is very doubtful if, at the ordinary price of labor (in New England), it would pay a practical farmer to subject the materials employed to the treatment outlined, and, economically considered, better and more satisfactory results could be obtained by the employment of stable manure in the customary way, and by the use of rational formulas, such as can readily be obtained from any official agricultural chemist.

"Some of the points claimed are not without marked interest. For example, it is stated that "lime is used to assist in the decomposition of the manure, and also to assist in retaining in the compound the valuable gaseous ammonia released by the other ingredients." This is somewhat startling, in view of the fact that agricultural chemists everywhere well know that lime is one of the most active substances in releasing and driving the ammonia out of its usual combinations.

"Bearing upon the use of soil in the mixture, an expression by one of our Rhode Island farmers seems to fit the case as aptly as anything which occurs to me. He wished a fertilizer as concentrated as possible, since there was soil enough on his farm with which it became mixed after its application, and he considered it an expensive and useless procedure to attempt to mix the farm with the fertilizer, and then to apply both.

"In view of the recent experiments by which it has been demonstrated that nitrogen may be lost by denitrification when nitrates are brought in contact with decomposing organic matter, such as stable manure, it is of particular interest to find that the gentleman who claims to be the originator of this process asserts that the manurial elements do not escape from the mass, and that it can be kept without loss for an indefinite length of time.

"This invention may serve a valuable purpose for those who are looking for that particular sort of thing. It is often stated that there are many farmers who are always ready to pay a large price for the use of a process which has about it some thing of the air of mystery, notwithstanding the fact that those who are familiar with such matters know of its worthlessness.

"Very truly yours, (Signed) H. J. WHEELER."*

"NORTH CAROLINA COLLEGE OF AGRICULTURE AND MECHANIC ARTS,

"WEST RALEIGH, February 13, 1902.

"MR. B. W. KILGORE, *State Chemist.*

"DEAR SIR:—I will outline briefly the changes of nitrogen compounds that would occur in Mr. Lipps' method of making fertilizer, as this is the biological side of the question, and the one with which I am most familiar.

"The nitrogen enters into the compost in three forms, as nitrate of soda (already a plant food), as proteids or ammoniated compounds in the manure, dependent upon the age of the manure, as ammonium sulfate, and a negligible amount of nitrogen in the dirt. It is in saving the nitrogen of the

* Doctor Wheeler is Director and Chemist of the Rhode Island Agricultural Experiment Station, and at present the President of the Association of Official Agricultural Chemists of the United States.

proteids, sodium nitrate, and ammonium sulfate that the virtue of the method must rest, if it have any value. The proteids, with or without the treatment, will, under the influence of the bacteria be converted largely into ammoniacal compounds. At this point a disadvantage rather than an advantage appears from Mr. Lipps' method, owing to the fact that the saltpeter will certainly, to some extent, percolate to the manure layer and there, in company with the ammonium sulfate, will meet the rich organic manure, supplying a condition conducive to *denitrification*, rather than to the opposite and beneficial change. This disastrous change is promoted by the fact that the heap is closely compacted, thereby creating a lack of oxygen, a condition highly conducive to denitrification. This loss of nitrogen will proceed until the organic matter of the manure and earth are oxidized, in the meantime occasioning loss to the farmer through deterioration in his saltpeter and ammonia and manure. After the oxidizable matter has been consumed the beneficial process of nitrification will ensue. It is not to be thought that Mr. Lipps' method could favor nitrification in any way adequate to compensate for the loss of nitrogen occasioned by bringing saltpeter into his mixture; nor does his method favor nitrification, a process that depends most rapidly in loose, rather than compact, heaps, as is well known by all.

"The conclusion must be that of the constituents used, the saltpeter and ammonium sulfate lose in value as plant foods by being mixed with the manure, and that there is no compensatory gain. Both of these constituents will yield greater value if placed singly upon the soil, loosely, and out of contact with fresh manure. The construction is one that hinders rather than favors the beneficial processes of nitrification.

"The claim that the salt is beneficial in preventing rusts and grubs is so clearly unfounded that all familiar with the nature and habits of any of these pests will clearly recognize the error.

(Signed) "F. L. STEVENS,
"*Professor of Biology.*"

6. That no one may be mistaken as regards the value we attach to the product from this process, we repeat here our former remarks on this phase of the question, which were contained in the two articles referred to in the first part of this discussion. Referring to the value of the product, it is said:

"It has considerable value and will increase the yields of crops.

"Ordinarily barnyard manure contains only about .35 per cent of phosphoric acid, .40 per cent of potash, and .60 per cent of ammonia.

"The Lipps mixture has considerably more value than average manure, and all know that manure is good fertilizer. Stock—the producers of manure—are the basis of the best and most prosperous agricultural systems in this and all other countries, and all the manure and other fertilizer materials on and around the farm should be scrupulously saved and used to maintain or increase the fertility of the farm. It is best used in connection with some acid phosphate and kainit, or other potash material, either in a compost or else by applying the manure to the land and adding at the same time, or later, the materials that furnish additional phosphoric acid and potash.

"But Mr. Lipps' ideas of the necessity of saving and utilizing the manure of the farm are not new. Most good farmers not only advocate, but practice

this. The materials he uses in connection with the manure and dirt are certainly such as we are all familiar with, and there is no ground for a claim to a "wonderful, scientific discovery" in their use; and, finally, there is nothing in his methods of employing the manure, dirt, and fertilizer materials in his formula that add to the value of any of them beyond what would be obtained in ordinary and well-known methods of making composts. The Lipps formula is such a compost formula as might have been recommended some ten or more years ago, but hardly at the present time, and there is certainly no reason why any farmer should pay $3.00 for what information it contains.

Just here the following from the circular advertising the process is interesting:

"Millions of dollars can be saved to the farmers of this country by making their own fertilizers. Since one of the most wonderful, scientific, far-reaching and beneficial inventions of the Nineteenth Century has been brought out by Prof. Michael M. Lipps (a noted chemist), who has thrown the powerful search-light of the laboratory upon the farm in behalf of the farmers, and the result has been the production of a process which has even astonished the scientific world. Just think of it! The farmers, by using this method, can produce a complete and well-balanced fertilizer. Good for all crops, at the small cost of between four and five dollars per ton. Was such a thing even ever dreamed of before? It is really the acme of the most profound scientific investigation and will challenge the world to produce a process equal to it. Remember this is no untried experiment, but instead, it is a well-established fact, having passed through the crucial test with many of the leading farmers of the country, and received their hearty approval. Wherever it is tested prejudice flies before it as chaff before the wind.

"For the benefit and convenience of farmers I have had published a Manual of Instructions, giving full and plain directions how to make the fertilizer by this process. The Manual also gives a great deal of other valuable information on the subject of farming, and especially how to manage, in a scientific manner, all fertilizing materials on the farm. It will tell you how to cut up or decompose stable manure in forty-eight hours as fine as powder, with one cheap chemical, which will only cost about 2½ cents per pound; a few pounds will cut up a ton. Every farmer should have one of these Manuals, which includes a Farm Right to make and use on his own land, or any he may cultivate. This invention means freedom to the farmer from the galling chains of debt, and hope and happiness for his family.

"When you read this circular, don't class this process with impracticable schemes you have known or heard of in the past; for I have the only genuine, truly-tested and practicable process ever known by which the farmers can really and successfully make their own fertilizers. * * *

"N. B.—This process is fully protected by the laws of the United States, and they will be rigidly enforced against any person infringing on the same.

"Farm Rights for sale, $3.00. Will sell territory, either township, counties or States.

PROF. MICHAEL M. LIPPS.

"Bluff City, Tenn."

It should be stated that the "Manual" referred to above contains the same and more information than the patent process.

B. W. KILGORE,
State Chemist.

TREATMENT FOR OAT SMUT.

BY F. L. STEVENS.

The amount of oat smut ranges far higher than the farmer is aware. Careful count will often show from 30 to 40 per cent in fields where the unobserving farmer sees none. It costs as much in land, tillage, seed and harrowing to raise a smut stalk as to raise the full head. This may all be prevented in oats and barley by treating the seed at a cost of about twelve cents per acre, including labor and material.

To treat oats, barley or wheat for smut prepare a solution of formalin (buy formalin at drug store from 75 to 90 cents per quart) in water. One pint of formalin to forty-five gallons of water. Place the seed to be treated on the barn floor and thoroughly saturate with the formalin solution, spray this on or pour it on and shovel over rapidly till every grain is thoroughly wet. Cover the pile with blankets and allow to stand over night. Now dry the seed with lime and remove extra lime by the fanning mill to facilitate drilling.

This treatment kills the adhering spores of the fungus that cause the smut and enables the farmer to sow clean seed. The result is a complete riddance of smut as well as a healthier plant in every way. The growth is stronger, fuller and greener.

The annual loss to the United States from oat smut alone is estimated at $18,000,000.

FERTILIZERS FOR TOBACCO*.

BY B. W. KILGORE.

The 1901 tobacco crop in North Carolina was 35 to 40 per cent short of an average crop. The prices were, however, so much better than those obtained during the past few years that the tobacco farmer has an air and feeling of prosperity, and the reports from different counties indicate that there will be an increase of from 25 to 40 per cent in the tobacco acreage in the various tobacco counties of the State. There are few products whose quality and quantity are more effected by kind of soil and fertilizer than is tobacco. For bright tobacco, the main kind grown in this State, the fine and deep sandy loam with yellow colored sandy clay subsoil is the type of land most largely used and the one which grows the best grade of this character of tobacco. Generally, the kind of soil that is suited to the production of tobacco. is better understood than the fertilizer that should be used on it. Evidence of this is seen in the great variation in the composition of fertilizers sold in the State, especially for use on the tobacco crop. In 1901 there were registered with the Department of Agriculture one hundred and eight (108) special fertilizers for tobacco. It is interesting in this connection to note the wide variation, as well as the average composition of these fertilizers. The highest amount of available phosphoric acid guaranteed in any of them was 9.25 per cent; the

* A large number of letters have and are still being received regarding fertilizers for tobacco. This article is published to answer more fully than can be done by letter these inquires.

lowest, 5 per cent, and the average 8.12 per cent. The highest amount of ammonia guaranteed was 10 per cent, the lowest 2 per cent, and the average 2.73 per cent. The highest amount of potash guaranteed was 5 per cent; the lowest 1 per cent, and the average 2.64 per cent. These wide variations in the amounts of the valuable fertilizer constituents indicate that the fertilizers themselves must have had very varying effects on the quality and quantity of the tobacco crop.

A study of the experiments in tobacco growing and a consideration of the experiences of good tobacco growers show that the amounts of ammonia and potash in the average tobacco fertilizers, as stated above, are not as large as are needed to give the best results. It would appear that the largest amount of ammonia (10 per cent) in any of these "specials" is greater than is required for bright tobacco, while the maximum quantity of potash (5 per cent) in any of the 108 brands is less than is used by numbers of our best bright tobacco growers, especially in the Eastern part of the State. A considerable number of these growers either mix their own tobacco fertilizers, or else have them put up according to formulas of their suggestion. Below are given five formulas for mixing fertilizers for tobacco. The grade of those fertilizers will be higher and they will, of course, cost more than the goods that are generally used in the State on tobacco, but I feel confident that the increased yield will more than justify the additional expense. In the *Bulletin* of the Department of Agriculture and in our correspondence with farmers, we have been recommending formulas of about the composition of these for a number of years, and evidence is accumulating which shows that the character of tobacco fertilizers is undergoing quite a considerable change.

No. 1—

Cotton-seed meal	900 pounds
Nitrate of soda	100 pounds
High-grade sulphate of potash	250 pounds
Acid phosphate, 14 per cent	750 pounds
Total, one ton	2,000 pounds

This mixture will contain, available phosphoric acid, 6.3 per cent; potash, 6.9 per cent; ammonia, 4.5 per cent.

No. 2—

High-grade dried blood	500 pounds
Nitrate of soda	125 pounds
High-grade sulphate of potash	310 pounds
Acid phosphate	1,065 pounds
Total, one ton	2,000 pounds

This mixture will contain, available phosphoric acid, 7.4 per cent; potash, 7.7 per cent; ammonia, 5.2 per cent.

No. 3—

Fish scrap	725 pounds
Nitrate of soda	100 pounds
High-grade sulphate of potash	300 pounds
Acid phosphate	875 pounds
Total, one ton	2,000 pounds

This mixture will contain, available phosphoric acid, 7.2 per cent; potash, 7.5 per cent; ammonia, 4.6 per cent.

No. 4—

Dried blood	500 pounds
Nitrate of soda	100 pounds
High-grade sulphate of potash	400 pounds
Acid phosphate	1,000 pounds
Total, one ton	2,000 pounds

This mixture will contain, available phosphoric acid, 7 per cent; potash, 10 per cent; ammonia, 5 per cent.

No. 5—

Cotton-seed meal	700 pounds
Nitrate of soda	100 pounds
High-grade sulphate of potash	300 pounds
Acid phosphate	900 pounds
Total, one ton	2,000 pounds

This mixture will contain, available phosphoric acid, 7.2 per cent; potash, 7.7 per cent; ammonia, 3.8 per cent.

Four hundred to one thousand pounds of these mixtures should be used to the acre.

The mixtures made from formulas Nos. 2 and 3 are somewhat more concentrated than that from No. 1, on account of cotton-seed meal containing less ammonia than fish scrap and dried blood. The three formulas are given to enable the use of any one of the three main organic, nitrogenous materials—dried blood, fish scrap and cotton-seed meal. In the coast sections, fish scrap and meal are both easily obtained; some distance inland meal is more accessible, while in the more western end of the tobacco belt it will be found convenient to use dried blood. All three are good sources of ammonia for tobacco. The other materials—nitrate of soda, sulphate of potash, and acid phosphate—are the same for all mixtures.

Occasional requests are made for formulas furnishing as much as 10 per cent of potash, and No. 4 has been arranged to meet needs of this nature. It is known that excellent tobacco, in quality and quantity, is grown by the use of fertilizers of this class, and some of our farmers greatly prefer them to others containing less potash. It takes considerable observation and experimentation to determine the best practice in matters of this kind.

A limited quantity of stable manure is very beneficial to tobacco and it succeeds well after peanuts. These materials add ammonia to the soil, and where heavy applications of fertilizers are to be made in connection with manure, and on peanut land, it would be well not to have so much ammonia in the fertilizers as is used in the ones employed on land not having other ammonia materials put on them. Formula No. 5 is designed to meet cases of this kind. A good many eastern tobacco growers plant tobacco after peanuts, and some of them grow peas between the hills of tobacco, planting them with hoes and putting six to ten peas in a place the latter part of June or early in July. This improves the soil for after-crops, but tobacco grown after tobacco and peas is said not to be of good quality, though, as would be expected, the growth is very large.

Good results will come from the use of high-grade fertilizers, such as are suggested above, or similar ones, and we believe that when once tried, there will be no inclination to go back to the lower grade ones now so largely used.

BROOM CORN CULTURE.

Much interest has been of late taken in the possibilities of raising broom corn in North Carolina for supplying the home markets. Certainly there can be no reason why broom corn may not be raised profitably here, if properly handled.

Herewith is presented a letter from Mr. J. L. Ingold, of Hickory, one of the most successful farmers and truckers in the good county of Catawba, giving his one year's experience in raising and handling broom corn; and, also, a carefully-prepared article on the culture and curing of broom corn, going somewhat more into details than given in Mr. Ingold's letter. Mr. Ingold writes as follows:

"I planted one and a half acres in broom corn last spring as an experiment, with a view of raising corn and manufacturing same into brooms, if I found the raising of corn would pay in this section. Part of the land I planted was in sweet potatoes the previous year and part in tomatoes. Both did well, and I was pleased with the crop raised. Did not weigh the crop to ascertain the exact yield, but was well enough pleased with results to buy machinery for making brooms, and in January manufactured 300 3-pound brooms and 150 brooms of less weight, and a few brushes, from my crop on the one and one-half acres. As this is my first experience, I am not prepared to say whether or not my crop was an average, good or poor yield, but I shall plant several acres this year. I will say I had very unfavorable weather in which to cut and save my crop of broom corn, as it set in wet weather about the time it was ready to cut and rained every day but one for three weeks, and while I let my corn get a little overripe waiting for sunshine, I at last cut it wet and saved it nicely."

The culture of broom corn heretofore has been almost exclusively in the middle West. The crop when mature is sent to our Southern cities for manufacture. It appears, therefore, that it might be, for a limited number of our Southern farmers, not only a profitable industry, but a satisfactory one as well. Under ordinary conditions the crop can be matured, yielding from

thirty to fifty dollars per acre. Of course, by additional experience this may be increased, as it is largely dependent on the skill of the grower and the fertility of the land.

THE SOIL AND ITS PREPARATION.

The soil for broom corn culture should be similar to that used in the production of Indian corn. It should be reasonably well drained, and should have a sufficient amount of moisture. What can be said in reference to the kind of soil for Indian corn may be applied in the same sense to its culture. A good, deep soil and thorough preparation is the first requisite. After thorough plowing the soil should be harrowed until it is finely pulverized so as to provide a good seed-bed. The harrow should be used up to the time of sowing, so as to destroy all the weeds that have germinated, for weeds are enemies of the broom-corn plant in the same way as they are of any other kind, and even more so, because of the very great likeness between many of the kinds of weeds and the young broom-corn stalk.

SEEDING AND CULTURE.

From five to ten pounds of broom-corn seed should be used per acre. This can be distributed in rows three or three and one-half feet apart, with the grains three to six inches apart. It should be thinned to one stalk in a place every four or five inches apart. The seed can be obtained from any reliable seed dealer at from $1.50 to $1.75 per bushel. The seed can be sown either by hand or by a hand planter. We have found the Planet, Jr., seed drill an exceptional good tool for this purpose. Let one not forget to begin the fight against the weeds at the very earliest moment. Thorough culture in the beginning is worth days of culture after the corn and weeds have both got a start. The cultivation should continue until the corn shades the ground, and it is advisable, in a dry season, to cultivate frequently enough to keep a mulch over the whole surface of the ground. There should never be permitted a crust to form over the top of the ground. This suggests that as soon as the ground is dry after a rain to give cultivation at once.

HARVESTING.

When the corn has approached maturity, so that it has passed the bloom stage, and the grains are in the milk stage, the top should be bent over, two rows the same way, with a drop of three feet, more or less. In two or three days the cutting is begun. The cut should be made just above the first joint. In thoroughly dry weather the corn can be left in the field, but this is always a great risk, because if a rain should come it would be sure to injure the grade and value of the product by mildew. We have found it safer and better to at once remove to shelter, or cover where it can be protected from the rain and heavy dews. When the broom corn is put away it should have free circulation of air so as to be thoroughly cured. It should be packed in thin layers so as to not hinder circulation of the air. Let the reader be assured that thorough curing is dependent to a great extent upon how this drying takes place. Unless the broom corn is cured thoroughly bright it will not command the top price of the market. It has a materially low price when improperly cured. Carefully-cured broom corn is a valuable and paying crop; improperly cured, it is unprofitable and unsatisfactory.

BEEF CATTLE FOR THE DEPARTMENT OF AGRICULTURE AND EXPERIMENT STATION.

The Department of Agriculture and the Experiment Station have purchased in Missouri a car-load of thirty-nine head of thoroughbred and high-grade beef cattle of the Aberdeen-Angus breed, for use in their experimental work on the Test Farm of the Department, in Edgecombe County, and on the Experiment Station farm near Raleigh. The cattle come from beyond the "tick" line, and are, therefore, subject to "tick" or "Texas" fever. They will be inoculated by the Veterinarian of the Department with the blood of one of our Southern cattle that has carried ticks; this will render them immune to after attacks of the fever.

Thirty of these animals will be used by the Department and by the Station, the remainder having been purchased for a number of farmers in different parts of the State.

Stock-raising is attracting more attention in North Carolina at present than it has ever done before. The announcement in the Raleigh papers a few days ago of the possibility of a beef famine in the city adds force to the already plain necessity of more cattle for the State. It would seem that the State should raise enough beef for its own consumption, and have some to spare—since we have in cotton-seed meal the richest and most valuable concentrated feed in the world, and our average per acre in hay production (the other essential in feeding) is equal to that of the greatest hay-producing State—Iowa—in the cattle-raising sections of this country. Statistics taken from the government reports show the adaptability of North Carolina land for hay production, the yield per acre of hay in ten of the States producing the largest average yield per acre being as follows:

	Tons Per Acre.
Louisiana	2.
Alabama	1.95
Texas	1.80
Mississippi	1.75
Georgia	1.69
Arkansas	1.63
Iowa	1.42
North Carolina	1.41
Tennessee	1.40
Kentucky	1.40

These figures show that Iowa is the only one of the North or Northwestern States—the ones that devote special attention to stock-raising—that has a hay yield equal to any of the Southern States. New York is considered especially as a hay-producing State, and yet the tonnage per acre is seventy-five per cent less than that of North Carolina.

We only need to make use of our natural advantages to become an important stock-raising State.

B. W. KILGORE.

STOCK-RAISING FOR PROFIT.

First-class beef cattle and hogs have brought good prices at all the principal markets for the last two years, but the extreme point reached during the last few weeks—from $6.50 to $7.50 for the former and from $7.00 to $7.35 for the

latter, per hundred pounds live weight—should serve to again emphasize the necessity of live-stock husbandry for the relief of the present depression in North Carolina agriculture.

Cotton, tobacco, corn and wheat will and should continue to be raised in increasing quantities in this State. There is no reason for the reduction of those staple crops, but the greatest need for an increase in our live-stock products, and this becomes all the more apparent when we reflect that such increase may be had without reducing the production of those crops which are looked upon as essential and peculiar to our State. In fact, the best argument that can be given in favor of the advantages of live-stock growing, is that it not only does not lessen the production of staple crops, but in conjunction with general farming, it is an additional source of revenue to the farm, and really increases the facilities for the growing of the so-called "money crops."

The average farmer can, at a trivial extra cost, make the rough forage necessary to feed a car-load of cattle. If he has the cattle, he will do so, but if the cattle are not on hand, he will not, and direct loss is the result.

Again, very little extra grain, over and above the cotton-seed meal used on the farm in the form of commercial fertilizer, will be necessary to complete the balance of the food necessary for the feeding of the car-load of cattle.

A car-load of twenty steers, weighing 1,200 pounds each, at $6.50 per hundred, is worth $1,560. Cattle weighing a little more, say 1,500 pounds each, and of the right quality, are bringing $7.50 per hundred pounds live weight. A car-load of twenty such cattle would sell for $2,250. Are these not sums of money worth striving for? Would not a car-load of such cattle relieve the depression on most North Carolina farms? Why should we not sell such cattle from our farms? Simply a lack of cattle and the inclination to breed and feed them.

We outrank any one of the four greatest hay-producing States of the Union in our ability to grow grass, and at present market prices for feeding stuffs, cotton-seed meal is the cheapest good cattle food known to the American farmer. Is it not apparent that our farmers are missing a great opportunity in failing to have good cattle to sell just now, at $6.50 to $7.50 per cwt.?

BIG GEESE.

Who would ever want to fool with the old-fashioned American goose after he has seen a flock of the great Toulouse or Embden geese? The Toulouse is the healthiest and most profitable of geese, as well as the largest. Think of a gander weighing twenty-five pounds, and a goose almost the same! Actually, they look as if they would weigh twice that, but the feathers make them look so frightfully big to one who must pick them. Of all fowls the goose is the hardiest. No cholera, no gapes, no lice to cut their life short.

TURKEY RAISING.

For their first meal, young turkeys should have onion tops, minced fine, also corn-bread or wheat-bread moistened in milk or water or squeezed dry. Do

not leave drinking-dishes within reach, as little turkeys are likely to get damp and chilled and drink foul water. Continue to feed onion tops, adding lettuce. They will turn from the daintiest morsel you can provide, and eat the green food eagerly. They soon learn the meaning of a bunch of onions, and when they see them in your hand, they will greet you with an enthusiasm that is amusing. With plenty of onions, your birds will thrive in spite of many drawbacks, and the feed bill, until they can forage for themselves, is reduced to a minimum. Of other food, corn-bread made of milk and soda and well baked is very good. When done, dampen the crust, cover and let it steam, and no other soaking is necessary. Do not feed what is sloppy or sour. Curds from sour milk are excellent for a change. Give plenty of grit. Nothing is better than broken dishes pounded up as fine as radish seed to begin with, and gradually coarsened. The whiteness seems to attract them, and the little birds will pick at it the first day.

If the little turkeys are left with the chicken hen, sprinkle her well with insect powder. A drop of lard on the wings of the little birds when the quills appear will be a help. Keep the roosting-coop perfectly clean, saturating the floor with kerosene just before night. Furnish plenty of dry earth and ashes for dusting. If the lice are persistent, fill the sewing-machine can with half and half lard and kerosene, and eject the mixture at the roots of the quills, around the vent, under the neck, and in the fold of skin extending from the thigh to the tail. Keep the little birds warm after this annointing, as they easily take cold.

When the wing quills first appear, it is good to pull out a few. All of this sounds like a great deal of trouble, but does not take long unless the flock is large. The feeding is the main part of the work, as that must be done about five times a day the first six or eight weeks. After that there is no danger of loss from ordinary causes. Nothing short of a drenching with cold dew or rain, or the depredations of hawks or "varmints" will depopulate the flock; they may be turned loose to shift for themselves. To prevent roaming while a heavy dew is on, feed as soon as day breaks. They will then plume themselves, and fly up somewhere to catch the first gleam of sunlight, before starting upon their day's search for insects. Feed a little at night to encourage them to roost at home. If the old turkeys are well cared for, they will hatch the third brood early in July. By that time there is little danger from dampness. These suggestions followed will insure success in turkey raising.

C. S. C.

PATENT STOCK FOODS AND CONDITION POWDERS.

The so-called "condition" powders, with which all stockmen are more or less familiar, seem to have occupied about the same place in the treatment of live stock as the old familiar and much-detested "bitters" which the mothers of thirty years ago thought necessary each spring for the general health of the family. In those good old days of our fathers the administration of these nostrums were generally preceded by taking from each horse and each member of the family a considerable quantity of blood. The practice was thought to cure the sick and prevent the well from becoming sick. While it is true that the bitter tonics repaired some of the injury done by the bleeding, still,

with the advance of intelligence among the masses the fallacy of the practice became apparent; but the old idea was too deeply implanted in the common mind to be crushed by the disapproval of medical science, and it arose again in a new garb as patent medicines and patent stock foods. The love of mystery, if not of humbug, so characteristic of the human mind, and the opportunities for secrecy and deception in the compounding of medicines, gave these new inventions a great field of operation.

The large amount of money expended by the farmers of North Carolina for these patent condimental stock foods or condition powders, justifies the fullest publicity of information concerning their composition and merits. The claims made for them by their manufacturers are briefly stated as follows:

1. That they will prevent disease.
2. That they will cure a great variety of diseases.
3. That they are composed of certain rare and mysterious ingredients in such proportions as will cause a normal or healthy animal to digest more food and make better use of a given quantity.
4. That they are of themselves foods of great and unusual value.

The first requisite to a specific and intelligent discussion of these claims is a knowledge of the composition of the mixtures. Fortunately, a chemical analysis readily shows their food value, that is, the amounts of the different food elements which they contain; while a microscopic examination of them reveals the kinds of materials of which they are composed.

The Experiment Stations have furnished this information in such a way as to preclude any probability of error. Massachusetts, Connecticut and North Carolina published bulletins on this subject so nearly at the same time as to make it certain that the work was done independently and without any knowledge of each other's results, and the close agreement of their findings gives additional assurance of their accuracy.

During the past year or two, International Stock Food has been extensively advertised and considerable of it sold in this State, while Pratt's Animal Regulator has also had a large and general sale. For this reason we have selected these two, and will give their composition as published in the bulletins above referred to.

According to the Connecticut Experiment Station, Bulletin No. 132, International Stock Food contains wheat feed, cayenne, salt, charcoal, and some bitter drug; Massachusetts, Bulletin No. 71, says it contains wheat offal, pepper, salt, charcoal, and some material rich in protein, and the December, 1900, Bulletin of the North Carolina Department of Agriculture says it consists of wheat bran, red pepper, charcoal and linseed meal. It will be noticed that all agree that wheat in some form is the principal ingredient. Pepper and charcoal are also found by all three, while salt and a material rich in protein—linseed meal by North Carolina—are found by two and a bitter drug by one. This is indeed a remarkable unanimity of results when it is remembered that these "foods" are not by any means constant in their composition, it apparently being the custom of the manufacturers to fill up with any odd material that happens to be cheap and convenient.

Pratt's Animal Regulator, according to the Connecticut bulletin, contains corn meal, salt, charcoal, fenugreek and a bitter drug, while the Massachusetts bulletin says it contains corn meal, salt, fenugreek and a bitter drug.

In both cases the bitter drug is thought to be gentian. The agreement is complete, hence almost certain to be accurate in all respects, except at the time the Massachusetts sample was made the manufacturer seems to have been out of charcoal, or perhaps it was just at that time so expensive that he could not afford to sell at $500 per ton.

The following tables show that the chemical analyses also agree as to the amounts of the different "food elements" contained in these mixtures:

INTERNATIONAL STOCK FOOD.

Authority.	Portein.	Fat.	Nitrogen-free Extract.	Crude Fibre.	Ash.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Massachusetts	16.97	9.35	48.22	8.63	7.74
Connecticut	14.31	4.67	47.88	14.51	12.50
North Carolina	15.06	3.87	----------	12.15	----------

PRATT'S ANIMAL REGULATOR.

Authority.	Portein.	Fat.	Nitrogen-free Extract.	Crude Fiber.	Ash.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Massachusetts	10.13	4.56	61.86	3.33	11.01
Connecticut	9.69	4.37	63.75	3.12	12.40
North Carolina	9.75	4.53	----------	3.13	----------

By keeping these analyses before us, we are now in a position to briefly consider the specific claims made by the manufacturers and judge of their accuracy. In calculating the value of either a medicine or a food, we must consider the cost and the results to be obtained from its use. The cost of International Stock Food is from $280 to $500 per ton, while that of Pratt's Animal Regulator is about the same.

Following the order in which we enumerated the claims made by the manufacturers, we may pertinently ask, Are wheat bran, charcoal, salt and pepper worth $500 a ton for the prevention of disease? It is scarcely necessary to say that these materials have no value above that recognized by all feeders, and are worth in combination or otherwise not more than ten per cent of what they cost when bought as International Stock Food.

The second claim made for these materials, namely, that they will cure a great number of diverse diseases, is equally false and ridiculous. It is a plain fact, approved by modern medical science, that a well animal does not need medicines, but is really injured by them if they are sufficiently active or strong to produce any appreciable effect. It is equally true that a sick animal should receive treatment for the special disease from which it is suffering. It is, therefore, apparent to any person that the claims made for these stock foods, or condition powders, that they will cure hog cholera, distemper, abortion and scours, make cows give more milk and hens lay, are impossible, even if he did not know the ingredients which they contain to be possessed of little or no

medicinal or curative value. If any reader doubts this statement, let him ask his family physician, in whom he has confidence, if pepper, salt, charcoal, fenugreek and gentian in extremely small quantities have any decided medicinal properties. Moreover, if these ingredients would in any quantity or proportion effect the marvellous cures claimed for them, the small amount contained in the prescribed doses of these stock foods would produce absolutely no effect. We have quite reliable information of a horse having eaten 12½ pounds of International Stock Food without any ill effects. It is evident that if that amount produced no appreciable effect, two or three tablespoonfuls would not effect the marvellous cures proclaimed in the advertisements.

The third claim enumerated is the one which seems to appeal most forcibly to the average farmer. No person acquainted with the subject is likely to be caught by this claim, but the average stock-owner will only be convinced by an actual feeding test. Such a test is absolutely worthless unless the animals selected are as nearly alike as it is possible to get them, and are kept under the same conditions. The food given, as well as the animals or their product, must all be weighed. Any trial made with less rigid or accurate conditions is worthless, but one such is of greater value than a hundred where neither the food nor the animals are weighed. Fortunately, many accurate tests have been made, and the results have been uniformly at variance with the claims of the manufacturers. One such test may be quoted from a bulletin of the Kansas Experiment Station, by D. H. Otis:

EXPERIENCE WITH ACME FOOD.

"On November 1, 1900, sixteen cows from the herd of the Kansas Agricultural College were divided into two lots as nearly equal as possible, on the basis of the yields of milk and butter fat for the month of October. One lot (cows fed Acme food) had the advantage by 212 pounds of milk and 17.4 pounds of butter fat for the month. Both lots were fed on alfalfa hay, with a grain ration of equal parts of corn chop and bran. In addition to this feed, one lot received Acme Stock Food fed according to directions. On December 1st, oats took the place of bran in the grain ration of both lots. The results for the three months (92 days) under experiment are as follows:

Eight Cows Receiving Acme Food.	
Milk produced, pounds	14,271
Test, per cent	4.39
Butter fat produced, pounds	626.7
Cost per pound of fat, cents	14.6

Eight Cows without Acme Food	
Milk produced, pounds	14,395
Test, per cent	4.13
Butter fat produced, pounds	595.9
Cost per pound of fat, cents	12.3

"The Acme Food lot consumed 136 pounds of Acme Food, which, at 11 cents (wholesale price), amounts to $14.96. Deduct this from the feed cost and the expense for feed in producing a pound of butter fat is reduced to 11.68 cents. The difference in the total production of butter fat can readily be accounted for by the difference in the lots at the commencement of the experiment, but granting that it is due to the effects of the Acme Food, it would make the extra butter fat cost 48 cents per pound.

EXPERIENCE WITH GLOBE STOCK FOOD.

"Taking the record for the month of January as the basis, a herd of twenty cows was divided into two lots as nearly equal as possible, there being only a difference of 1.4 pounds of butter fat in the total yield for the month. All the cows received alfalfa hay for roughness and equal quantities of corn and cob-meal and oats for the grain ration. One lot received the Globe Stock Food in addition. The results for two months (59 days) are as follows:

	Ten Cows with Globe Food.	*Ten Cows without Globe Food.*
Milk produced, pounds	12,784	12,896
Test, per cent	4.05	3.96
Butter fat produced, pounds	518.1	511.3
Cost per pound of fat, cents	11.7	11

"If the Globe Food be eliminated from this experiment, the cost of producing a pound of butter fat is the same in both lots. The totals for two months show that the cows receiving the Globe Food produced 6.8 pounds the most butter fat. Globe Food sells for 9 cents per pound (wholesale rates). The ten cows consumed 43.3 pounds, worth $3.89, or a cost of 57 cents for each extra pound of butter fat produced."

The value of any given food material is best estimated and appreciated by comparing its price with others containing about the same amounts of the different "food elements."

Since the microscope showed us that the principal ingredient of International Stock Food is wheat offal, or wheat bran, we would expect the chemical analysis to correspond very closely with that of wheat bran, and such is the case. Its slightly inferior feeding value and other unimportant variations from ordinary wheat bran are the result of the charcoal, salt, pepper and other useless and inferior substances with which the wheat bran was adulterated.

Wheat bran may be purchased for from $20 to $25 a ton in North Carolina, while the other ingredients are even cheaper, yet tons upon tons of this stuff mixed up, called International Stock Food and thoroughly advertised, are being sold at from fifteen to twenty times that amount.

The same facts apply to Pratt's Animal Regulator. The microscope told us that it was composed almost exclusively of corn meal, and the chemical analysis is consequently similar to that of corn. The more extensively advertised article sells at from $400 to $500 a ton, while corn meal may be purchased for less than one-tenth that price, even with corn at a dollar a bushel.

In conclusion, it may be freely stated that the so-called stock foods and condition powders on the market, when tested by accurate and practical feeding trials, when judged as medicines, when compared in price with other materials of the same feeding value, or when measured by the claims made for them by the manufacturers, are frauds pure and simple. If the live stock is well and properly cared for and fed, it needs no medicine. If care and feed are needed, the best may be had on any market for less than one-tenth that charged for them when put up in one or two-pound packages and advertised as "stock food" or "condition powder."

The question often arises, why is it if these stock foods are all frauds that so many honest and intelligent men think they have obtained good results from their use? The answer is not difficult. There is in every organism an

inherent tendency to return to normal conditions, or, in other words, to get well if sick.

A man, when he gets to the point of buying "condition powders" for his horse, is ready to give him the better care and food, which alone would and does bring about the desired improvement in condition. The "stock food" gets the credit, although it does contain nothing but wheat bran, charcoal and pepper and salt. If it is a tonic that the horse, cow or pig is in need of, why not purchase gentian, iron and nux vomica direct from the druggist at half cost? They will not only cost less, but if medicine is really needed, are much more likely to produce the desired effect. TAIT BUTLER, *Vet.*

MEDALS TO NORTH CAROLINA WON AT THE CHARLESTON EXPOSITION.

Following is the list of medals awarded, so far, to North Carolina at the South Carolina Interstate and West Indian Exposition, exhibited under the auspices of the State Board of Agriculture:

GOLD MEDALS.

Hackburn & Willet, New Bern; tubers and truck crops.
Holt & Homewood, Burlington; collective exhibit of cereals, etc.
Briggs & Fleming, Wilson; orange wrapper tobacco.
North Carolina Board of Agriculture, Raleigh; tobacco.
J. G. Roney, Wilson; tobacco.
Garrett & Co., Weldon; white wines—Escarpernong.
A. D. McNair, Southern Pines; Japanese persimmons.
H. E. Newbury, Magnolia; bulbous plants.
North Carolina Board of Agriculture, Raleigh; green pomaceous fruits—apples.
North Carolina Board of Agriculture, Raleigh; collective exhibit of preserved fruits.
J. B. Thompson, Whiteville; pecan nuts.
J. Van Lindley Orchard Co., Southern Pines; drupaceous fruits.
North Carolina Board of Agriculture, Raleigh; collection of woods.
S. E. Asbury, Raleigh; collection of mica.
T. K. Bruner, Raleigh, collection of cut gems.
North Carolina Board of Agriculture, Raleigh; building stones.
North Carolina Board of Agriculture, Raleigh; minerals, gems, crystals and ores.
N. C. Talc and Mining Co., Hewitts; talc, cut and ground.
National Marble Co., Murphy; Koneteha marble.
J. H. Pratt, Chapel Hill; gems and gem minerals.
A. H. Smith & Co., New York; cut and rough rubies, rhodolites.
T. K. Bruner, distinguished services.

SILVER MEDALS.

Carolina Peanut Co., Weldon; Spanish peanuts.
North Carolina Board of Agriculture, Raleigh; agricultural products.

W. L. Petty & Co., Rocky Mount; tobacco.
Garrett & Co., Weldon; sherry and port wines.
Garrett & Co., Weldon; brandies.
M. Bill, Fayetteville; pears.
Geo. N. Ives & Son, Newport; drupaceous fruits.
Whiting Bros., Raleigh; table grapes.
H. H. Brimley, Raleigh; abrasives—corundum.
W. A. Graham, Machpelah; amethyst crystals.
J. A. Holmes, Chapel Hill; minerals—monazite.
North Carolina Board of Agriculture, Raleigh; building stones—marble.
North Carolina Board of Agriculture, Raleigh; metallurgy of copper.
North Carolina Board of Agriculture, Raleigh; metallurgy of iron.
North Carolina Board of Agriculture, Raleigh; useful minerals.
J. H. Pratt, Chapel Hill; collective exhibit of minerals.
The Boyd Furniture Co., Raleigh; furniture for public buildings.

BRONZE MEDALS.

John Faulkner, Goldsboro; leaf tobacco.
Garrett & Co., Weldon, sparkling wines.
Spiritine Chemical Co., Wilmington; products of woody substances.
Harris Clay Co., Dillsboro; kaolin clay.
Hydraulic White Brick Co., Wilmington; white brick.

HONORABLE MENTION.

William Dunn, New Bern; agricultural products.
North Carolina Board of Agriculture, Raleigh; cotton.
Asa Parham, Goldsboro; leaf tobacco.
W. B. Wray, Cane River; nuts.
Gurney Manufacturing Co., Roan Mountain (post-office in Tennessee); manufactured wood.

DIPLOMA OF MERIT.

North Carolina Board of Agriculture, Raleigh; for installation. (This is the highest award given for installation.)

INDEPENDENT EXHIBITS.

These awards were given to exhibits made outside the Board of Agriculture's exhibit in Mines and Forestry Building.

GOLD MEDALS.

Cannon Manufacturing Co., Concord, cannon cloth.
Chatham Manufacturing Co., Elkin; blankets.
High Shoals Co., Hardin; domestic sheetings and hosiery yarns.
Holt's North Carolina Mills, Fayetteville; sheetings, plaids, checks, yarns, etc.

SILVER MEDALS.

Atherton Mills, Charlotte; yarns for making lace curtains.

Avalon Mills, Mayodan; colored cotton yarns for underwear and hosiery.

Avon Mills, Gastonia; convertible goods, watered and mercerized linings and skirtings.

Florence Mills, Forest City; unbleached drills and sheetings.

Gastonia Manufacturing Co., Gastonia; colored linings and skirtings.

Henrietta Cotton Mills, Henrietta; unbleached sheetings.

Laboratory Cotton Mills, Lincolnton; yarns, skeins and warp, etc.

Loray Mills, Gastonia; unbleached sheetings and drillings.

Mayo Mills, Mayodan; white cotton yarns for underwear and hosiery.

The Nantahala Co., Franklin; specimens hard wood.

Steele's Mills, Rockingham; print cloths and prints.

St. Augustine's School, Raleigh; industrial work of students.

BRONZE MEDALS.

Myrtle Furnishing Co., High Point; desk.

Piedmont Table Company, High Point; dining tables.

I.

FERTILIZER ANALYSES—FALL SEASON, 1901; SPRING SEASON, 1902.

BY B. W. KILGORE, STATE CHEMIST.

The analyses presented in this *Bulletin* are of samples collected by the fertilizer inspectors of the Department, under the direction of the Commissioner of Agriculture, during the fall months, 1901, and the spring months of 1902, and, therefore, represent the character of fertilizers the farmers have used on the crops of the past year. They should receive the careful study of every farmer in the State who uses fertilizer, as by comparing the analyses in the *Bulletin* with the claims made for the fertilizers actually used, the farmer can know whether or not they contained the fertilizing constitutents in the amounts they were claimed to be present.

TERMS USED IN ANALYSES.

Water-soluble Phosphoric Acid.—Phosphate rock, as dug from the mines, mainly in South Carolina, Florida and Tennessee, is the chief source of phosphoric acid in fertilizers.

In its raw, or natural, state the phosphate has three parts of lime united to the phosphoric acid (called by chemists tri-calcium phosphate). This is very insoluble in water and is not in a condition to be taken up readily by plants. In order to render it soluble in water and fit for plant food, the rock is finely ground and treated with sulphuric acid, which acts upon it in such a way as to take from the three-lime phosphate two parts of its lime, thus leaving only one part of lime united to the phosphoric acid. This one-lime phosphate is what is known as water-soluble phosphoric acid.

Reverted Phosphoric Acid.—On long standing some of this water-soluble phosphoric acid has a tendency to take lime from other substances in contact with it, and to become somewhat less soluble. This latter is known as reverted or gone-back phosphoric acid. This is thought to contain two parts of lime in combination with the phosphoric acid, and is thus an intermediate product between water-soluble and the original rock.

Water-soluble phosphoric acid is considered somewhat more valuable than reverted, because it becomes better distributed in the soil as a consequence of its solubility in water.

Available Phosphoric Acid is made up of the water-soluble and reverted; it is the sum of these two.

Water-soluble Ammonia.—The main materials furnishing ammonia in fertilizers are nitrate of soda, sulphate of ammonia, cotton-seed meal, dried blood, tankage and fish scrap. The first two of these (nitrate of soda and sulphate of ammonia) are easily soluble in water and become well distributed in the soil where plant roots can get at them. They are, especially the nitrate of soda, ready to be taken up by plants, and are, therefore, quick acting forms of ammonia. It is mainly the ammonia from nitrate of soda and sulphate of ammonia that will be designated under the heading of water-soluble ammonia.

Organic Ammonia.—The ammonia in cotton-seed meal, dried blood, tankage, fish scrap, and so on, is included under this heading. These materials are

insoluble in water, and before they can feed plants they must decay and have their ammonia changed, by the aid of the bacteria of the soil, to nitrates, similar to nitrate of soda.

They are valuable then as plant food in proportion to their content of ammonia, and the rapidity with which they decay in the soil, or rather the rate of decay, will determine the quickness of their action as fertilizers. With short season, quick-growing crops, quickness of action is an important consideration, but with crops occupying the land during the greater portion, or all, of the growing season, it is better to have a fertilizer that will become available more slowly so as to feed the plant till maturity. Cotton-seed meal and dried blood decompose fairly rapidly, but will last the greater portion, if not all, of the growing season in this State. While cotton seed and tankage will last longer than meal and blood, none of these act so quickly, or give out so soon, as nitrate of soda and sulphate of ammonia.

Total Ammonia is made up of the water-soluble and organic. It is the sum of these two.

The farmer should suit, as far as possible, the kind of ammonia to his different crops, and a study of the forms of ammonia as given in the tables of analyses will help him to do this.

VALUATIONS.

To have a basis for comparing the values of different fertilizer materials and fertilizers, it is necessary to assign prices to the three valuable constituents of fertilizers—ammonia, phosphoric acid, and potash. These figures, expressing relative value per ton, are not intended to represent crop-producing power, or agricultural value, but are estimates of the commercial value of ammonia, phosphoric acid, and potash in the materials supplying them. These values are only approximate, as the cost of fertilizing materials are liable to change as other commercial products are, but they are believed to fairly represent the cost of making and putting fertilizers on the market. They are based on a careful examination of trade conditions, wholesale and retail, and upon quotations of manufacturers.

Relative value per ton, or the figures showing this, represents the prices on board the cars at the factory, in retail lots of five tons or less, for cash.

To make a complete fertilizer the factories have to mix together in proper proportions materials containing ammonia, phosphoric acid and potash. This costs something. For this reason it is thought well to have two sets of valuations—one for the raw or unmixed materials, such as acid phosphate, kainit, cotton-seed meal, etc., and one for mixed fertilizers.

The values used last season were:

VALUATIONS FOR 1901.

IN UNMIXED OR RAW MATERIALS.

For ammonia	14	cents per pound
For phosphoric acid in acid phosphate	4	cents per pound
For phosphoric acid in fine bone meal	3	cents per pound
For phosphoric acid in medium and coarse bone meal	2½	cents per pound
For potash	5	cents per pound

IN MIXED FERTILIZERS.

For ammonia	16	cents per pound
For phosphoric acid	4½	cents per pound
For potash	5½	cents per pound

The valuations decided on for this season, for the reasons already given, are:

VALUATIONS FOR 1902.

IN UNMIXED OR RAW MATERIALS.

For ammonia	13	cents per pound
For phosphoric acid in acid phosphate	4	cents per pound
For phosphoric acid in fine bone meal	3	cents per pound
For phosphoric acid in medium and coarse bone meal	2½	cents per pound
For potash	5	cents per pound

IN MIXED FERTILIZERS.

For ammonia	15	cents per pound
For phosphoric acid	4½	cents per pound
For potash	5½	cents per pound

HOW RELATIVE VALUE IS CALCULATED.

In the calculation of relative value it is only necessary to remember that so many per cent means the same number of pounds per hundred, and that there are twenty hundred pounds in one ton (2,000 pounds).

With an 8—2—2 goods, which means that the fertilizer contains available phosphoric acid 8 per cent, potash 2 per cent, and ammonia 2 per cent, the calculation is made as follows:

Percentage or Lbs. in 100 Lbs.	Value Per 100 Lbs.	Value Per Ton 2,000 Lbs.
8 pounds available phosphoric acid at 4½ cents.	0.36×20=	$7.20
2 pounds potash at 5½ cents	0.11×20=	2.20
2 pounds ammonia 15 cents	0.30×20=	6.00
Total value	0.77×20=	$15.40

Freight and merchant's commission must be added to these prices. Freight rates from the seaboard and manufacturing centers to interior points are given in the following table:

FREIGHT RATES FROM THE SEABOARD TO INTERIOR POINTS.—*From the Published Rates of the Associated Railways of Virginia and the Carolinas—In Carloads, of not less than ten tons each, per ton of 2,000 pounds. Less than Carload, add 20 per cent.*

Destination.	From Wilmington, N. C.	From Norfolk and Portsmouth, Va.	From Charleston, S. C.	From Richmond, Va.
Advance	$3.20	$3.20	$3.40	$3.20
Apex	2.70		3.80	3.00
Ashboro	3.20	3.20	3.60	3.20
Asheville	4.00	4.00	4.00	4.00
Chapel Hill	2.95	3.20	3.90	3.20
Charlotte	2.65	3.30	3.20	3.20
Clayton	2.48	2.86	3.63	2.83
Cherryville	2.85	3.60	3.40	3.60
Clinton	1.60	3.00	3.20	3.00
Creedmore	3.00	3.00	3.80	3.00
Cunningham	3.00	2.40	4.00	2.40
Dallas	3.00	3.60	3.40	3.60
Davidson College	3.00	3.20	3.20	3.20
Dudley	1.70	3.00	3.20	3.00
Dunn	2.00	2.80	3.20	2.80
Durham	2.80	2.83	3.60	2.83
Elkin	3.60	3.20	3.60	3.20
Elm City	2.10	2.60	3.20	2.60
Fair Bluff	1.60	3.80	2.40	3.80
Fayetteville	1.80	3.00	3.00	3.00
Forestville	2.85	3.00	3.80	3.00
Gastonia	3.00	3.56	3.36	3.56
Gibsons	2.10	3.50	3.50	3.50
Goldsboro	1.80	2.80	3.20	2.80
Greensboro	2.96	3.00	3.40	3.00
Hamlet	2.00	3.00	3.60	3.00
Henderson	2.95	3.00	3.80	3.00
Hickory	3.20	3.60	3.85	3.60
High Point	3.00	3.08	3.40	3.08
Hillsboro	2.88	2.88	2.68	2.88
Kernersville	3.00	3.00	3.40	3.00
Kinston	2.40	2.50	3.50	2.50
Laurel Hill	1.90	2.40	3.80	3.40
Laurinburg	1.90	3.40	3.80	3.40
Liberty	2.72	3.60	3.80	3.60
Louisburg	2.95	3.00	3.80	3.00
Lumberton	1.60	3.60	3.70	3.60
Macon	3.05	3.00	3.85	3.00
Madison	3.10	3.00	3.00	3.00
Matthews	2.60	3.20	3.20	3.20
Maxton	1.80	3.40	3.00	3.40
Milton	3.44	2.40	4.00	2.40
Mocksville	3.36	3.20	3.40	3.20
Morven	2.55	3.60	2.50	3.60
Mount Airy	2.20	3.40	3.80	3.40
Nashville	2.30	2.90	3.40	2.90
New Bern	1.80	1.75	3.95	1.79
Norwood	3.68	3.20	3.20	2.23
Oxford	3.04	2.83	3.80	2.85
Pineville	2.77	3.25	3.00	3.20
Pittsboro	2.60	3.30	4.10	3.30
Polkton	2.40	3.00	2.20	3.00
Raleigh	2.56	2.83	3.63	2.83
Reidsville	3.00	2.96	3.40	2.36
Rockingham	2.10	3.00	3.80	3.00
Rocky Mount	2.20	2.50	3.40	2.50
Ruffin	3.28	2.80	3.40	2.20
Rural Hall	3.28	3.20	3.60	3.20
Rutherfordton	3.05	3.65	3.40	3.65
Salisbury	3.25	3.20	3.20	3.20
Sanford	2.20	3.00	3.40	3.00
Selma	2.40	2.80	3.20	2.80
Shelby	2.95	3.60	3.40	3.60
Siler City	2.60	3.60	3.80	3.60
Smithfield	2.20	2.80	3.20	2.80
Statesville	3.50	3.20	3.60	3.20
Stem	2.95	2.83	3.80	2.83
Tarboro	2.30	2.40	3.00	2.40
Waco	2.90	3.60	3.40	3.60
Wadesboro	2.30	3.00	2.50	3.00
Walnut Cove	3.12	3.00	3.40	3.00
Warrenton	3.05	3.25	4.10	3.25
Warsaw	1.50	3.00	3.20	3.00
Washington	2.65	1.75	2.25	1.50
Weldon	2.55	1.90	3.85	1.90
Wilson	2.00	2.60	3.20	2.60
Winston-Salem	3.00	3.00	3.40	3.05

ANALYSES OF COMMERCIAL FERTILIZERS—FALL SEASON, 1901.

Laboratory No.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100. Water-Soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-Soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Potash.	Relative Value Per Ton at Factory.
	MIXED FERTILIZERS.											
	Brands claiming						8.00			2.00	1.00	$14.30
1744	Baugh & Sons Co., Norfolk, Va	Baugh's Double Eagle Phosphate.	Statesville	S	5.30	3 94	9.24	1.01	1.42	2.43	1.24	16.97
1773	do	Baugh's Old Standby Raw Bone Superphosphate.	Concord	R	5 60	4.05	9.05	.88	1 50	2.38	1.25	16.66
1741	Columbia Guano Co., Norfolk, Va.	Carolina Soluble Guano	Salisbury	R	4.10	4.09	8.19	.45	1.95	2.40	1.06	15.74
1725	Navassa Guano Co., Wilmington, N. C.	Navassa Complete Fertilizer	Stokesdale	R	5.05	3.39	8.44	1.07	1.20	2.27	1.64	16.21
1721	Reidsville Fertilizer Co., Reidsville. N. C.	Bauner Fertilizer	Germantown	R	4.52	3.87	8.39	.60	1.53	2.13	1.42	15.50
1745	Richmond Guano Co., Richmond, Va.	Bone Mixture	Statesville	R	4.25	5.30	9.55	.40	1.41	1.81	.94	15.06
1753	Va.-Car. Chem. Co., Richmond, Va.	Allison&Addison's Star Brand Guano.	Asheville	D	5.05	2.95	8.00	1.35	.76	2.11	1.05	14.68
1723	do	Beef, Blood and Bone Fert.	Walnut Cove	R	5.35	3.30	8.65	.67	1.42	2.09	1.13	15.30
1782	do	Durham Ammoniated Fert.	Lexington	D	5.37	3.87	9.24	1.04	.99	2.03	1.72	16.29
	Brand claiming						8.00			2.00	1.50	14.85
1777	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Crown Brand Ammoniated Guano.	Concord	R	5.22	3.55	8.77	.46	1.82	2.28	1.47	16.35
	Brands claiming						8.00			2.50	1.50	16.35
7770	Charlotte Oil and Fertilizer Co., Charlotte, N. C.	Charlotte Ammoniated Fertilizer-Meal Goods.	Charlotte	R	4.50	2.77	7.27	.44	2.61	3.05	1 63	17.48
1743	do	do	Barber's Junction	R	3.82	3.51	7.33	.16	2.50	2.66	1.38	16.09
	Brands claiming						8.00			2.00	2.00	15.40
1742	Charlotte Oil and Fertilizer Co., Charlotte, N. C.	King Cotton Grower	Norwood	N	5.35	2.27	7.62	.24	2.24	2.48	2.08	16.59
1758	do	The Leader	Davidson	D	4.72	3.45	8.17	.10	1.96	2.06	2.55	16.34
1710	Columbia Guano Co., Norfolk, Va.	Columbia Soluble Guano	Reidsville	S	5 27	3.31	8.58	.49	1.54	2.03	2.13	16.15
1794	Farmers Guano Co., Raleigh, N. C.	State Standard Guano	Siler City	R	4.88	3.53	8.41	.46	1.55	2.01	1.86	15.64
1734	Navassa Guano Co., Wilmington, N. C.	Navassa Grain Fertilizer	Lincolnton	R	5.77	2.44	8.21	1.28	.98	2.26	1.87	16.22
1792	Powhatan Chemical Co., Richmond, Va.	Magic Special Fertilizer	Siler City	R	4.68	4.45	9.13	.49	1.24	1.73	1.71	15.29

1771	Rasin-Monumental Co., Baltimore, Md.	Rasin's Empire Guano	Charlotte	S	6.52	3.02	9.54	.88	1.27	2.15	2.08	17.32
1724	Royster, F. S. Guano Co., Norfolk, Va	Farmers Bone Fertilizer	Madison	R	5.62	2.68	8.30	.34	1.89	2.23	1.97	16.33
1687	Southern Chemical Co., Winston, N. C.	Electric Standard Guano	N. Wilkesboro	D	5.75	3.06	8.81	.78	1.39	2.17	2.83	17.55
1688	Swift Fertilizer Works, Atlanta, Ga.	Swift's Golden Harvest Standard Grade Guano.	N. Wilkesboro	D	5.10	4.74	9.84	.62	1.38	2.00	1.51	16.52
1746	Va.-Car. Chemical Co., Richmond, Va.	Allison & Addison's Anchor Brand Fertilizer.	Mooresville	D	7.80	1.86	9.66	1.17	1.01	2.18	2.38	17.85
1711	do	Farmers Friend Fertilizer	Reidsville	D	5.40	3.93	9.33	.52	1.54	2.06	1.59	16.32
1699	do	Genuine Bone and Peruvian Guano.	Pilot Mountain	R	6.08	2.81	8.89	.83	1.22	2.05	1.57	15.88
1747	do	National Fertilizer	Mooresville	D	7.15	3.33	10.48	1.18	.94	2.12	2.81	18.88
1783	do	Old Dominion Soluble Guano	High Point	D	2.70	4.16	6.86	1.16	1.22	2.38	1.74	15.23
	Brand claiming						8.00			2.50	2.00	16.90
1774	Lister's Agricultural Chemical Works, Newark, N. J.	Lister's Ammoniated Dissolved Bone Phosphate.	Concord	R	4.92	3.70	8.62	.85	2.13	2.98	2.44	19.38
	Brand claiming						8.50			2.00	2.00	15.85
1776	Acme Mfg. Co., Wilmington, N. C.	Gem Fertilizer	Concord	R	7.05	3.20	10.25	.26	2.20	2.46	2.01	18.81
	Brand claiming						8.00			2.75	2.00	17.65
1676	N. C. Cotton Oil Co., Raleigh, N. C.	Raleigh Standard Guano	Greensboro	D	4.00	4.10	8.10	.32	3.24	3.56	2.20	20.39
	Brand claiming						8.00			2.75	2.75	18.48
1722	Reidsville Fertilizer Co., Reidsville, N. C.	Royal Fertilizer	Germantown	D	5.10	2.95	8.05	1.19	1.78	2.97	2.98	19.43
	Brand claiming						8.00			2.50	3.00	17.00
1700	Va.-Car. Chemical Co., Richmond, Va.	N. C. Official Farmers Alliance Guano.	Pilot Mountain	R	6.62	2.59	9.21	.74	1.78	2.52	2.52	18.62
	Brand claiming						8.00			3.00	3.00	19.50
1775	Baugh & Sons Co., Norfolk, Va	Grand Rapid Guano	Concord	R	5.30	4.03	9.33	2.19	1.45	3.64	3.54	23.21
	Brands claiming						9.00			2.00	2.00	16.30
1785	Etiwan Fertilizer Co., Charleston, S. C.	Plow Brand Ammoniated Dissolved Bone.	Salisbury	D	6.45	3.18	9.63	.42	1.79	2.21	2.60	18.16
1793	Ober, G., & Sons Co., Baltimore, Md.	Ober's Special Ammoniated Dissolved Bone.	Concord	R	10.82	1.94	12.76	.64	1.86	2.50	2.65	21.90
	Brand claiming						9.00			2.25	1.00	12.58
1772	Bradley Fertilizer Co., Boston, Mass	Sea Fowl Guano	Charlotte	R	4.92	5.35	10.27	.90	1.43	2.33	1.42	17.79
	Brand claiming						9 25			2 50	2.00	18.03
1761	Patapsco Guano Co., Baltimore, Md.	Patapsco Guano	Cornelius	R	7.00	3.51	10.51	.90	1.88	2.78	2.12	20.13
	Brand claiming						11.00			3.00	4.00	23.30
1760	Charlotte Oil and Fert. Co., Charlotte, N. C.	Oliver's Perfect Wheat Fert	Davidson	D	8.30	2.18	10.48	.16	3.54	3.70	6.11	27.25
	Brand claiming						13.00			2.50		19.20
1692	Baugh & Sons Co., Norfolk, Va	Baugh's Pure Dissolved Animal Bone.	Winston	R	1.20	13.72	14.92	1.71	.92	2.63		21.32
	Brand claiming						8.50				2.00	9.85
1797	Union Guano Co., Winston, N. C.	Prize Bone and Potash	Siler City	S	5.00	4.07	9.07				2.72	11.15

N, D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

ANALYSES OF COMMERCIAL FERTILIZERS—FALL SEASON, 1901—Continued.

Laboratory No.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.							Relative Value Per Ton at Factory.
					Water-Soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-Soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Potash.	
	MIXED FERTILIZERS.											
	Brand claiming						8.00				2.25	9.67
1739	Navassa Guano Company, Wilmington, N. C.	Warlick's Mixture	Newton	R	4.92	3.39	8.31				2.41	10.13
	Brands claiming						8.00				3.00	10.50
1735	Charlotte Oil and Fertilizer Co., Charlotte, N. C.	McRary's Diamond Bone and Potash.	Lincolnton	R	3.15	5.58	8.73				3.06	11.22
1796	Navassa Guano Company, Wilmington, N. C.	Harvey's Bone and Potash	Siler City	D	1.73	5.43	7.16				3.29	10.06
	Brands claiming						8.00				4.00	11.60
1779	Swift Fertilizer Works, Atlanta, Ga	Swift's Plantation Standard Grade Phosphate and Potash.	Charlotte	D	2.40	4.99	7.39				3.75	10.77
1754	Va.-Car. Chem. Company, Richmond, Va.	Carr's Special Wheat Grower	Asheville	D	1.37	6.81	8.18				4.03	11.79
1712	do	Travers Special Wheat Compound.	Reidsville	R	2.37	5.88	8.25				3.31	11.06
	Brand claiming						10.00				1.50	10.65
1737	Va.-Car. Chemical Co., Richmond, Va.	Great Wheat and Corn Grower.	Lincolnton	D	6.55	4.28	10.83				1.73	11.65
	Brands claiming						10.00				2.00	11.20
1678	Acme Mfg. Co., Wilmington, N. C.	Acme Bone and Potash	Greensboro	N	6.70	3.79	10.49				1.48	11.07
1736	American Fert. Co., Norfolk, Va	Dissolved Bone and Potash for Wheat and Corn.	Shelby	R	1.22	8.91	10.13				1.94	11.25
1778	Charlotte Oil and Fert. Co., Charlotte, N. C.	Ten and Two Per Cent Bone and Potash.	Charlotte	D	3.92	5.77	9.69				2.02	10.94
1714	Columbia Guano Co., Norfolk, Va.	Columbia Bone and Potash Mixture.	Greensboro	R	5.50	5.08	10.58				2.32	12.07
1786	Farmers Guano Co., Raleigh, N. C.	Century Bone and Potash Mixture.	Norwood	D	5.72	5.39	11.11				2.72	12.99
1780	MacMurphy, W. C. Co., Charleston, S C.	Acid Phosphate and Potash	Charlotte	R	6.45	2.79	9.24				2.43	10.99
1701	Navassa Guano Co., Wilmington, N. C.	Navassa Dissolved Bone and Potash.	Mount Airy	D	6.35	4.35	10.70				2.06	11.90
1795	Powhatan Chemical Co., Richmond, Va.	Bone and Potash Mixture	Siler City	D	5.30	5.33	10.63				1.69	11.42
1706	Richmond Guano Co., Richm'd, Va.	Alkaline Bone	Pilot Mountain	D	6.65	5.14	11.79				1.60	12.37

1729	----do	Bone and Potash Mixture	Stokesdale	D	7.17	5.44	12.61				1.83	13.36
1680	Royster, F. S. Guano Co., Norfolk, Va.	Royster's Bone and Potash	Elkin	R	4.85	4.51	9.36				1.69	10.28
1690	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Electric Bone and Potash	Winston	R	5.95	5.16	11.11				1.83	12.12
1703	Southern Chem. Co., Winston, N. C	Mammoth Wheat and Grass Grower.	Mount Airy	S	6.60	2.88	9.48				2.49	11.27
1727	----do	Winston Bone and Potash Compound.	Reidsville	R	6.52	3.82	10.34				2.20	11.73
1689	Swift's Fert. Works, Atlanta, Ga	Swift's Wheat Grower	N. Wilkesboro	D	4.65	5.41	19.06				1.86	11.10
1679	Union Guano Co., Winston, N. C	Perfection Wheat Grower	Elkin	S	6.50	3.58	10.08				2.39	11.70
1691	Va.-Car. Chem. Co., Richmond, Va.	Allison & Addison's B. P. Potash Mixture.	Winston	D	2.35	7.09	9.44				1.46	10.10
1738	----do	Blue Ridge Wheat Grower	Cherrysille	D	5.45	4.64	10 09				1.98	11.26
1702	----do	Capital Bone and Potash Compound.	Pilot Mountain	D	6.45	4.02	19.47				2.00	11 62
1749	----do	Eureka Bone and Potash Compound.	Statesville	D	6.22	4.06	10.28				1.45	10.85
1704	----do	Norfolk Bone and Potash	Mount Airy	D	6.00	4.22	10.22				1.90	11.29
1748	----do	Standard Wheat Grower	Norwood	D	7.77	5.44	13.21				2.19	14.30
	Brands claiming						10.00				3.00	12.30
1716	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Morris and Scarboro's Special Bone and Potash Mixture for Wheat.	Ashboro	N	6.65	4.88	11.53				2.43	13.05
1715	Southern Chem. Co., Winston, N. C	Farmers Pride—Bone and Potash Mixture.	Ashboro	R	6.50	3.56	10.06				2.90	12.24
1713	Va.-Car. Chem. Co, Richmond, Va.	Diamond Wheat Manure	Reidsville	D	3.12	6.78	9.90				2.14	11.26
1798	----do	Planters Bone and Potash Mixture.	Siler City	D	5.90	4.28	10.18				2.31	11.70
	Brand claiming						10.00				4.00	13.40
1726	Southern Chem. Co., Winston, N. C.	Winner Grain Mixture	Reidsville	R	7.07	3.82	10.89				4.34	14.57
	Brand claiming						11.00				2.00	12.10
1707	Pocomoke Guano Co., Norfolk, Va.	Alkali Bone	Pilot Mountain	D	7.17	5.76	12.93				2.13	13.98
	Brand claiming						13.00				3.00	15.00
1705	Richmond Guano Co., Richmond, Va	Premium Bone and Potash Mixture.	Pilot Mountain	D	8.62	5.38	14.00				2.39	15.23

RAW OR UNMIXED FERTILIZER MATERIALS

	Brands claiming						10.00					8.00
1781	Charlotte Oil and Fertilizer Co., Charlotte, N. C.	Catawba Acid	Charlotte	D	4.87	5.03	9.90					7.92
1730	Navassa Guano Co, Wilmington, N. C.	Croatan Acid Phosphate	Stokesdale	D	3.95	5.98	9.93					7.94
1698	Richmond Guano Co., Richmond, Va.	Old Homestead Dissolved Bone	Winston	R	5.60	5.38	10.98					8.78
1693	Southern Chem. Co., Winston, N. C	Horse Shoe Acid Phosphate	N. Wilkesboro	D	3.20	6.83	10.03					8.02
1709	Va.-Car. Chem. Co., Richmond, Va.	hampion Acid Phosphate	Pilot Mountain	N	6.65	4.83	11.48					9.18
1751	----do	Owl Brand Acid Phosphate	Mocksville	D	6.42	5.42	11.81					9.47
1757	----do	Norfolk Reliable Acid Phosphate.	Asheville	N	.77	11.48	12.25					9.80

N, D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

ANALYSES OF COMMERCIAL FERTILIZERS--FALL SEASON, 1901—Continued.

RAW OR UNMIXED FERTILIZER MATERIALS.

Laboratory No.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100. Water-Soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-Soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Potash.	Relative Value Per Ton at Factory.
	Brands claiming						12.00					9.60
1697	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Staple Acid Phosphate	Winston	D	5.25	6.13	11.38					9.10
1788	Columbia Guano Co., Norfolk, Va.	Columbia High Grade Acid Phosphate.	Salisbury	R	4.27	7.36	11.63					9.30
1750	Charlotte Oil and Fertilizer Co., Charlotte, N. C.	Charlotte Dissolved Bone	Norwood	D	7.50	4.64	12.14					9.71
1787	Union Guano Co., Winston, N. C.	Red Seal Acid Phosphate	High Point	R	5.30	7.19	12.49					9.99
1755	Va.-Car. Chem. Co., Richmond, Va.	Allison & Addison's Standard Acid Phosphate.	Shelby	D	7.17	5.18	12.35					9.88
1696	do	Capital Dissolved S. C. Bone	Centerville	N	5.82	6.24	12.06					9.65
1686	do	Owl Brand Acid Phosphate	Elkin	N	8.50	4.68	13.18					10.54
	Brands claiming						13.00					10.40
1720	Armo'r Fert. Works, Baltimore, Md	Armour's Acid Phosphate	Ashboro	N	9.42	4.94	14.36					11.49
1740	Charlotte Oil and Fertilizer Co., Charlotte, N. C.	Charlotte Acid Phosphate	Newton	D	9.67	3.56	13.23					10.58
1718	Columbia Guano Co., Norfolk, Va.	Columbia High Grade Dissolved Bone.	Greensboro	R	7.82	5.80	13.62					10.90
1789	Etiwan Fert. Co., Charleston, S. C.	Diamond Soluble Bone	Salisbury	N	11.25	1.99	13.24					10.59
1801	Farmers Guano Co., Raleigh, N. C.	Farmers High Grade Acid Phosphate.	Siler City	D	7.50	5 76	13.26					10.61
1769	MacMurphy, W. C. Co., Charleston, S. C.	High Grade Acid Phosphate	Huntersville	N	11.40	2.96	14.36					11.49
1741	Navassa Guano Co., Wilmington, N. C.	Navassa High Grade Dissolved Bone.	Lincolnton	N	8.60	3.55	12.15					9.72
1799	Powhatan Chem. Co., Richmond, Va.	Powhatan Acid Phosphate	Siler City	D	6.65	6.65	13.30					10.64
1763	Royster, F S. Guano Co, Norfolk, Va.	Royster's High Grade Dissolved Bone.	Elkin	R	6.85	5.89	12.74					10.19
1731	Southern Chem. Co., Winston N. C.	Victor Dissolved Bone	Reidsville	R	7.40	5.50	12.90					10.32

1764	Swift Fertilizer Works, Atlanta, Ga	Swift's Capital High Grade Acid Phosphate.	Wilkesboro	N	7.12	6.42	13.54					10.83
1695	Va-Carolina Chemical Co., Richmond, Va.	Allison & Addison's I X L Acid Phosphate.	N. Wilkesboro	D	8.02	6.59	14.61					11.69
1684	do	Crenshaw's Acid Phosphate	Elkin	N	7 75	4.06	11.81					9.45
1708	do	Double Bone Phosphate—Extra Strong.	Pilot Mountain	D	8.07	5.02	13.09					10.47
1762	do	Norfolk Best Acid Phosphate	Elkin	D	7.25	8.21	15.46					12.37
1756	do	Owl Brand Acid Phosphate	Rutherfordton	N	9.17	4.81	13.98					11.18
	Brands claiming						14.00					12.20
1685	Acme Mfg. Co., Wilmington, N. C.	Acme Acid Phosphate	Greensboro	N	10.55	4.06	14.61					11.69
1768	Patapsco Guano Co., Baltimore, Md	Patapsco Pure Dissolved S. C. Phosphate.	Cornelius	D	11.65	4.88	16.53					13.22
1691	Pocomoke Guano Co., Norfolk, Va.	Peerless Acid Phosphate	Norwood	N	9.75	6.33	16.08					12.86
1717	Rasin-Monumental Co., Baltimore, Md.	Rasin's Acid Phosphate	Reidsville	D	9.27	5.27	14.54					11.63
1694	Va.-Car. Chem. Co., Richmond, Va.	Allison & Addison's Fulton Acid Phosphate.	N. Wilkesboro	N	9.85	5.16	15.01					12.41
1800	do	V.-C. C. Co.'s 14 Per Cent Acid Phosphate.	Siler City	N	9.52	3.79	13.31					10.65
	Brand claiming						15.00					12.00
1765	Charlotte Oil and Fert. Co., Charlotte, N. C.	Charlotte 15 Per Cent Acid Phosphate.	Davidson	D	10.72	3.59	14.31					11.45
	Brands claiming						16.00					12.80
1767	Columbia Guano Co., Norfolk, Va	Columbia 16 Per Cent Acid Phosphate.	Davidson	R	4.07	13.69	17.76					14.21
1728	Royster, F. S. Guano Co., Norfolk, Va.	Royster's 16 Per Cent Acid Phosphate.	Madison	R	12.05	5.65	17.70					14.16
	Brands claiming									3.50		
1752	Southern Chem. Co., Winston, N. C	Shin Bone Meal—Real Animal Bone.	Mooresville	D					4.14	4.14		* 25.70
1733	Baugh & Sons Norfolk, Va.	Baugh's Fine Ground Meal	Madison	D					3.38	3.38		† 19.92

N, D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

* Total Phosphoric Acid found, 24.90 per cent, valued in bone meal at three cents per pound.

† Total Phosphoric Acid found, 18.55 per cent.

ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1902.

Laboratory No.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100. Water-Soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-Soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Potash.	Relative Value Per Ton at Factory.
	MIXED FERTILIZERS.											
	Brands claiming						8.00			2.00	1.00	14 30
2281	American Agricultural Chemical Co., New York, N. Y.	Zell's Ammoniated Bone Superphosphate.	Wilson	R	6.28	3.48	9.76	.95	1.82	2.77	1.38	18.61
1958	do	do	Edenton	R	6.20	2.35	8.55	.93	1.29	2.22	2.28	16.86
2110	Baugh & Sons Co., Norfolk, Va	Baugh's Double Eagle Phosphate.	Statesville	R	5.42	2.99	8.41	.65	1.50	2.15	1.32	15.47
1999	do	do	Center Hill	R	5.60	3.44	9.04	1.05	1.34	2.39	1.22	16.65
1821	do	Old Stand-By-Baugh's Raw Bone Superphosphate.	Wilmington	R	4.23	4.62	8.85	.69	1.68	2.37	1.28	16.48
2233	Caraleigh Phosphate and Fert. Works, Raleigh, N. C.	Comet Guano	Ashboro	R	6.62	2.00	8.62	.22	2.08	2.30	2.07	16.93
2128	Charlotte Oil and Fert. Co., Charlotte, N. C.	Queen of the Harvest	Dunn	D	6.38	1.83	8.21	.36	1.98	2.34	1.64	16.21
2049	Columbia Guano Co., Norfolk, Va.	Carolina Soluble Guano	Henderson	S	5.48	2.93	8.41	.53	1.74	2.27	1.19	15.69
2074	Navassa Guano Co., Wilmington, N. C.	Navassa Complete Fertilizer	Forest City	R	7.35	1.85	9.20	1.34	.86	2.20	1.00	15.98
2059	Piedmont-Mount Airy Guano Co., Baltimore, Md.	Piedmont Guano for Cotton	New Bern	R	4.00	4.83	8.83	1.29	.86	2.15	1.24	15.76
2096	Reidsville Fertilizer Co., Reidsville, N. C.	Banner Fertilizer	Mebane	R	6.78	1.70	8.48	.70	1.38	2.08	1.52	15.54
2123	Royster, F. S., Guano Co., Norfolk, Va.	Caledonia Compound	Dunn	D	5.92	2.65	8.57	.39	1.67	2.06	1.00	14.99
1885	do	Special Compound Cotton Grower.	LaGrange	S	5.40	4.03	9.43	.42	1.64	2.06	1.13	15.91
2273	do	Special Compound	Walnut Cove	S	5.65	3.23	8.88	1.04	1.44	2.48	1.54	17.13
2178	Southern Chemical Co., Winston, N. C.	Yadkin Complete Fertilizer	Reidsville	R	6.15	1.63	7.78	.53	1.77	2.30	1.50	15.55
2214	Tomlinson, Bynum & Co., Wilson, N. C.	Dixie Cotton Grower	Wilson	R	4.33	4.33	8.66	.12	1.90	2.02	1.24	15.22
1954	Va.-Car. Chem. Co., Richmond, Va.	Allison & Addison's Star Brand Guano.	Wilson	D	5.38	2.90	8.28	.99	1.16	2.15	1.00	15.10

1808	Va.-Car. Chemical Co., Richmond, Va.	Beef, Blood and Bone Fertilizer.	Faison	S	6.43	1.99	8.42	.97	1.57	2.54	1.07	16.37
2298	----do	----do	Garysburg	D	4.62	4.02	8.64	.52	1.54	2.06	1.03	15.09
2167	----do	Catawba Guano	Charlotte	R	5.90	2.24	8.14	.99	1.58	2.57	1.22	16.38
2129	----do	Crescent Brand Ammoniated Fertilizer.	Dunn	D	6.25	2.21	8.46	1.14	1.06	2.20	2.13	16.56
1992	----do	Double Owl Brand Guano	Goldsboro	R	6.20	2.09	8 29	.36	1.74	2.10	.74	14.57
2047	----do	Durham Ammoniated Fertilizer.	Durham	S	4.78	2.96	7.74	.55	1.86	2.41	1.09	15.39
2215	----do	North State Guano	Wilson	D	7.38	1.91	9.29	.39	1.98	2.37	1.47	17.09
2263	----do	Orient Complete Manure	Springhope	R	6.45	2.65	9.10	.51	2.17	2.68	1.68	18.02
1913	----do	----do	Elizabeth City	D	5.65	2.43	8.08	.79	1.24	2.03	1.20	14.68
1989	----do	Progressive Farmer Guano	Fremont	D	5.25	2.69	7.94	1.95	1.31	3.26	1 99	19.11
2269	----do	----do	Pilot Mountain	R	5.28	2.96	8.24	.81	1.54	2.35	1.08	15.65
2075	----do	Standard Raw Bone Soluble Guano	Lattimore	D	6.50	1.75	8.25	1.68	.86	2.54	1.48	16.67
2066	----do	Vinco Guano for Tobacco	Roxboro	R	7.30	1.30	8.60	.94	1.38	2.32	1.84	14.92
2019	Va. State Fertilizer Co., Lynchburg, Va.	Highland King	King's Mount'n	R	6.15	2.52	8.67	.14	1.80	1.94	1.18	16.69
	Brands claiming						8.00			2.00	1.50	14.85
1890	American Fert. Co., Norfolk, Va.	Peruvian Mixture	LaGrange	S	5.73	2.95	8.68	.31	2.30	2.61	1.93	17.76
1901	----do	----do	Lumberton	S	5.15	2.76	7.91	.80	1.40	2.20	1.74	15.60
2081	Caraleigh Phosphate and Fert. Works, Raleigh, N. C.	Crown Brand Ammoniated Guano.	Davidson	D	7.85	1.83	9.68	.22	1.82	2.04	2.03	17.06
1961	Imperial Co., Norfolk, Va.	Imperial Cotton Grower	Edenton	R	4.65	3.38	8.03	1.09	1.56	2.65	1.88	17.24
2105	----do	Standard Premium Guano	Jamesville	R	6.48	2.84	9.32	.81	1.70	2.51	1.37	17.42
	Brands claiming						8.00			2.50	1.00	15.80
1967	Acme Manufacturing Co., Wilmington, N. C.	Acme Soluble Bone	Laurinburg	R	5.23	2.77	8.00	.23	2.51	2.74	1.03	16.55
2115	Atlantic Chemical Co., Norfolk, Va.	Atlantic Cotton Grower	Morven	R	5.62	2 62	8.24	1.02	1.58	2.60	1.25	16.59
1980	Etiwan Fertilizer Co., Charleston, S. C.	Raw Bone Superphosphate	Wadesboro	R	6.48	2.71	9.19	1.53	1.04	2.57	1.14	17.23
2234	Royster, F. S., Guano Co., Norfolk, Va.	Arrow Brand Guano	Star	R	5.00	3.00	8.00	1.59	1.35	2.94	1.37	17.53
2011	Va.-Car. Chem. Co., Richmond, Va.	Capital Cotton Fertilizer	Monroe	R	5.82	2.40	8.22	1.22	1.50	2.72	1.38	17.08
1900	----do	Gibb's & Co.'s H. G. Ammoniated Guano.	Lumberton	R	5.18	2.71	7.89	1.49	1.33	2.82	1.28	16.97
	Brands claiming						8.00			2.50	1.50	16.35
2040	Va.-Car. Chemical Co., Richmond, Va.	Charlotte Ammoniated Fertilizer.	Charlotte	R	6.48	1.21	7.69	.30	3.14	3.44	1.64	19.04
1932	----do	----do	Lumberton	N	5.78	2.65	8.43	.79	2.28	3.07	1.74	18.71
	Brands claiming						8.00			2.00	2.00	15.40
2205	American Agricultural Chemical Co., New York, N. Y.	Purity Guano	Conway	R	4.85	3.32	8.17	.88	1.32	2.20	2.14	16.31
2260	----do	Reese's Pacific Guano	Reidsville	D	6.60	2.66	9.26	1.02	1.75	2.77	2.25	19.12

N, D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1902—Continued.

Laboratory No.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100. Water-Soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-Soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Potash.	Relative Value Per Ton at Factory.
	MIXED FERTILIZERS											
	Brands claiming						8.00			2.00	2.00	$15.40
2203	American Agricultural Chemical Co., New York, N. Y.	Triumph Soluble Guano	Ahoskie	D	7.45	2.09	9.54	.84	1.24	2.08	2.08	17.11
2107	American Fert. Co., Norfolk, Va.	American Cotton Compound	Norwood	R	6.60	2.27	8.87	.50	1.70	2.20	2.19	16.99
1983	do	Bone and Peruvian Guano	Wadesboro	R	6.15	2.22	8.37	1.00	1.00	2.00	2.09	15.83
2198	do	Hannah's Special Formula Guano.	Ruffin	R	6.43	1.85	8.28	.74	2.00	2.74	2.80	18.75
1893	Armour Fertilizer Works, Baltimore, Md.	Armour's General 2-8-2 Fertilizer.	Kinston	S	1.23	7.34	8.57	.39	1.78	2.17	1.72	16.11
2064	Arps, Geo. L., & Co., Norfolk, Va.	High Grade Premium Guano	Chapel Hill	S	6.25	2.57	8.82	.96	1.26	2.22	2.05	16.85
1995	Ashepoo Fert. Co., Charleston, S C.	Carolina Guano	Monroe	D	6.48	2.94	9.42	1.49	1.05	2.54	2.19	18.51
1933	Atlantic Chem. Co., Norfolk, Va.	Atlantic Soluble Guano	Lumberton	R	5.38	2.50	7.88	.60	1.52	2.12	2.08	15.74
2239	Bailey, J. L. & Co., Elm City, N. C.	Stag Brand Guano	Elm City	R	5.32	3.68	9.00	.69	2.20	2.89	2.48	19.50
1843	Baugh & Sons Co., Norfolk, Va.	Baugh's Animal Bone and Potash Compound for all Crops.	Washington	R	5.03	4.29	9.32	.75	1.45	2.20	2.20	17.41
1805	do	Baugh's Fish Mixture	Faison	S	5.75	3.49	9.24	.35	1.74	2.09	2.36	17.18
1846	Bragaw, Wm. & Co., Washington, N. C.	Old Reliable Premium High Grade for all Crops.	Washington	R	6.45	3.22	9.67	1.29	1.02	2.31	2.07	17.91
1845	do	Tar Heel Special Guano for all Crops.	do	S	7.05	2.02	9.07	.94	1.28	2.22	2.31	17.36
1899	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Eli Ammoniated Fertilizer	Lumberton	R	5.20	3.32	8.52	.42	2.20	2.62	2.40	18.17
1894	Columbia Guano Co., Norfolk, Va.	Columbia Soluble Guano	Kinston	R	5.15	3.13	8.28	.21	1.85	2.06	2.15	16.00
2087	Cowell, Swann & McCotter Co., Bayboro, N. C.	Cowell, Swann & McCotter Co.'s Crop Guano.	Bayboro	R	4.52	3.68	8.20	.58	1.94	2.52	3.33	18.60
1849	Farmers Guano Co., Raleigh, N. C.	Crumpler's Standard Premium	Washington	R	5.18	3.25	8.43	.42	1.92	2.34	2.32	17.16
2108	do	State Standard Guano	Norwood	R	5.35	2.91	8.26	.16	2.12	2.28	2.05	16.53
1952	Hadley, J. C. & Co., Wilson, N. C.	John Hadley's Special High Grade Plant Food.	Wilson	D	7.33	.67	8.00	.26	2.03	2.29	2.34	16.64
2202	Imperial Co., Norfolk, Va.	Folks' Peanut and Corn Guano	Reynolds	R	5.98	2.53	8.51	.77	1.50	2.27	2.27	16.96
2004	do	Imperial Champion	Scotland Neck	S	4.90	2.86	7.76	2.56	2.51	5.07	2.34	24.77
2201	do	Imperial Cisco Soluble Guano	Kelford	R	5.15	3.02	8.17	.96	1.72	2.68	2.37	18.00
2002	do	Trucker's Delight for all Crops	Granville	S	6.50	2.09	8.59	.88	1.51	2.39	2.00	17.10
2242	Lister's Agricultural Chemical Works, Newark, N. J.	Lister's Ammoniated Dissolved Bone Phosphate.	Macon	R	.25	8.63	8.88	.85	1.83	3.68	2.51	18.79

1969	Lynchburg Guano Co., Lynchburg, Va.	Lynchburg Soluble Guano	Cameron	R	6.03	2.83	8.86	.23	1.93	2.16	2.23	16 91
1981	MacMurphy, W. C. Co., Charleston, S. C.	Special Cotton and Corn Guano	Wadesboro	D	6.95	2.02	8.97	.18	2 23	2.41	2.09	17.60
1870	Meadows, E. H. & J. A. Co., New Bern, N. C.	Meadows' Cotton Grower	New Bern	R	6.60	4.05	10.65	.42	1.70	2.12	2.72	18.94
1817	Navassa Guano Co., Wilmington, N. C.	Navassa Cotton Fertilizer	Wallace	R	6 00	2.29	8.29	1.12	.88	2.00	2.21	15.89
2291	----do	----do	Rocky Mount	D	6.55	1.86	8.41	1.09	.92	2.01	2.05	15.85
2036	----do	Occoneechee Tobacco Grower	Youngsville	R	6.38	1.96	8.34	.42	1.76	2.18	2.11	16.37
2261	Ober, G. & Sons Co., Baltimore, Md.	Ober's Special Cotton Compound.	Springhope	R	9.90	1.60	11.50	1.07	1.96	3.03	2.86	22.59
2212	----do	----do	Apex	R	8.33	1.39	9.72	.93	1.47	2.40	2.78	19.01
2065	----do	Ober's Standard Tobacco Fertilizer.	Roxboro	S	8.06	1.41	9.49	.52	2.00	2.52	2.69	19.06
2159	Patapsco Guano Co., Baltimore, Md.	Planter's Favorite	Reidsville	R	6.90	2.41	9.34	.82	1.44	2.26	2.05	17.44
1853	----do	Sea Gull Ammoniated Guano	Mt. Olive	R	6.68	3.11	9.79	.97	1.24	2.21	2.14	17.79
2192	Piedmont-Mt. Airy Guano Co., Baltimore, Md.	Piedmont Red Leaf Tobacco Guano.	Leaksville	R	5.95	3.50	9.45	1.22	.95	2.17	2.13	17.36
2131	----do	Piedmont Special for Cotton, Corn and Peanuts.	Dunn	R	6.02	2.78	8.80	.91	1.19	2.10	2.05	16.47
2092	Pocahontas Guano Co., Lynchburg, Va.	Carrington's Banner Brand	Hillsboro	R	6.40	2.26	8.66	.38	1.62	2.00	1.94	15.93
1831	Pocomoke Guano Co., Norfolk, Va.	Pamlico Superphosphate	Magnolia	R	5.30	3.45	8.75	.71	1.38	2.09	2.36	16.74
1850	----do	Pocomoke Superphosphate	Washington	R	6.75	2.32	9.07	1.10	1.36	2.46	2.33	18.10
1922	Powhatan Chem. Co., Richmond, Va.	Magic Cotton Grower	New Bern	R	5.82	3.44	9.26	.27	1.88	2.15	9.14	17.14
1996	----do	----do	Monroe	R	6.60	3.47	10.07	.49	1.65	2 14	1.90	17.57
2296	----do	----do	Severn	R	5.02	4.09	9.11	.40	2.01	2.41	2.33	17.99
2035	----do	Magic Special Fertilizer	Youngsville	R	7.05	2.99	10.04	.45	1.81	2.26	1.93	17.94
2256	----do	Magic Tobacco Grower	Pilot Mountain	R	6.00	8.00	9.00	.37	1.67	2.04	2.27	16.72
1960	Raisin-Monumental Co., Baltimore, Md.	Rasin's Empire Guano	Edenton	D	6.63	2.20	8.83	1.53	1.40	2 93	1.72	18.63
2109	Read Phosphate Co., Charleston, S. C.	Reid's Blood and Bone Fertilizer.	Mooresville	R	6.98	1.71	8.69	.26	2.06	2.32	2.20	17.20
2283	Reidsville Fertilizer Co., Reidsville, N. C.	Champion Guano	Randleman	R	5.15	3.09	8.24	.88	1.70	2.58	2.24	17.62
2098	----do	----do	Mebane	D	8.60	3.25	11.85	.85	1.46	2.31	2.03	19.83
2009	Richmond Guano Co., Richmond, Va.	Premium Brand Fertilizer	Monroe	R	6.32	3.12	9.44	.33	2.10	2.43	2.03	18.02
2132	----do	----do	Burlington	R	6.42	3.47	9.89	.42	1.65	2.07	1.75	17.03
2301	----do	----do	Garysburg	R	5.48	2.56	8.04	.56	2.14	2.70	2.48	18.06
2048	----do	Premium Tobacco Fertilizer	Henderson	R	6.58	1.73	8.31	.51	2.08	2.59	2.04	17.49
1855	Royster, F. S. Guano Co., Norfolk, Va.	Farmers' Bone Fertilizer	Mt. Olive	R	5.43	3.75	9.18	.92	1.33	2.25	2.39	17.64
2124	----do	----do	Runn	R	6.12	3.43	9.55	.40	1.62	2.02	1.96	16.81
2282	----do	----do	Raleigh	R	5.28	3.15	8.43	1.17	1.41	2.58	2.01	17.54
2126	Southern Chem. Co., Winston, N. C.	Electric Standard Guano	Dunn	D	6.30	1.96	8.26	.71	1.61	2.32	2.13	16.74

N, D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1902—Continued.

Laboratory No.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.							Relative Value Per Ton at Factory.
					Water-Soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-Soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Potash.	
	MIXED FERTILIZERS.											
	Brands claiming						8.00			2.00	2.00	$15.40
1978	Swift Fert. Works, Atlanta, Ga	Swift's Golden Harvest Standard Guano.	Wadesboro	R	5.80	2.93	8.73	.54	1.58	2.12	2.07	16.49
1924	Va.-Car. Chemical Co., Richmond, Va.	Allison & Addison's Anchor Brand Fertilizer.	New Bern	R	4.95	3.31	8.26	.60	1.67	2.27	2.16	16.62
1947	do	Cotton-seed Meal Soluble Guano.	Lucama	R	5.50	2.26	7.76	.76	1.48	2.24	2.05	15.96
2305	do	do	Nashville	D	6.10	1.81	7.91	.85	2.21	3.06	2.12	18.63
1860	do	Eagle Island Ammoniated Guano.	Goldsboro	D	5.65	2.29	7.49	1.15	1.15	2.30	2.41	16.70
2099	do	Electric Tobacco Grower	Efland	R	5.92	1.79	7.71	.70	1.92	2.62	2.13	17.14
1991	do	Eureka Ammoniated Bone	Fremont	D	6.68	2.45	9.13	1.02	1.02	2.04	1.18	15.63
2297	do	do	Margarettsville	R	5.52	2.34	7.86	.37	1.81	2.18	2.68	16.56
1934	do	Farmers' Favorite Fertilizer	Lumberton	R	2.15	3.60	8.75	1.62	1.98	3.60	2.59	21.52
1875	do	Farmers' Friend Fertilizer	Hertford	R	6.63	1.87	8.50	.82	1.40	2.22	2.26	16.80
1802	do	Genuine Bone and Peruvian Guano.	Faison	S	6.33	2.06	8.39	.97	1.17	2.14	2.10	16.28
1810	do	Genuine Slaughter-house Bone Guano.	do	D	6.25	1.77	8.02	1.18	.91	2.09	2.30	16.02
1911	do	do	Elizabeth City	S	6.20	2.08	8.28	.94	2.24	2.18	2.15	16.36
2910	do	King Cotton Grower	Monroe	R	6.25	1.55	7.80	.50	2.43	2.93	1.87	17.87
1809	do	National Fertilizer	Faison	D	6.43	1.92	8.35	.91	1.36	2.27	1.85	16.36
2303	do	do	Rocky Mount	D	7.55	1.85	9.40	.89	1.06	1.95	1.80	16.29
2213	do	National Special Tobacco Fertilizer.	New Hill	D	4.50	1.96	6.46	1.54	1.27	2.81	1.73	16.15
1818	do	Old Dominion Soluble Guano.	Rose Hill	R	6.08	1.94	8.02	1.21	1.22	2.43	2.26	16.99
1865	do	Old Dominion Soluble Tobacco Guano.	New Bern	R	5.20	3.66	8.86	.66	1.40	2.06	2.[illegible]6	16.63
2130	do	Old Hickory Guano	Dunn	R	6.88	1.89	8.77	1.49	.93	2.42	2.43	17.82
2176	do	Orient Special for Tobacco	Reidsville	R	6.30	2.00	8.36	.59	1.51	2.10	2.01	16.03
1959	do	Owl Brand Guano	Edenton	R	6.58	1.72	8.30	1.02	1.36	2.38	2.23	17.06
2041	do	The Leader	Charlotte	R	6.58	1.67	8.25	.27	2.35	2.62	1.67	17.12
1867	do	Tinsley's Lee Brand Guano	New Bern	R	5.05	3.10	8.15	.55	1.69	2.24	2.19	16.46
1940	do	Tinsley's Stonewall Guano	Selma	R	4.00	3.63	7.63	.82	1.18	2.00	2.68	15.81

1862	do	Tinsley's Stonewall Tobacco Fertilizer.	New Bern	R	5.63	3.32	8.95	.74	1.61	2.35	2.11	17.42
2217	do	do	Stoneville	D	6.45	2.10	8.55	.47	1.76	2.23	1.57	16.11
2122	do	Wilson Standard	Dunn	D	6.50	1.55	8.05	.32	1.97	2.29	2.67	17.05
1939	do	Winston's Special for Cotton	Selma	D	6.68	2.23	8.91	.18	1.90	2.08	2.49	17.00
2292	Va. State Fertilizer Co., Lynchburg, Va.	Virginia State High Grade Guano.	Mocksville	R	7 35	3.04	10.39	.49	1.76	2.25	2.01	18.31
1891	do	do	LaGrange	R	5.28	4.21	9.49	.43	1.61	2.04	2.25	17.13
1892	do	do	do	R	4.98	4.68	9.66	.70	1.68	2 38	2.15	18.20
	Brands claiming						8 00			2.50	2.00	16.90
2183	Acme Manufacturing Co., Wilmington, N.C.	Acme Standard Guano	Burgaw	D	7.03	1.72	8.75	.28	2.24	2.52	2.02	17.66
1851	do	Lattimer's Complete Fert	Washington	R	6.08	2.74	8 82	.24	2.24	2.48	2 00	17 58
2083	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Eclipse Ammoniated Guano	Chapel Hill	R	7.58	1.65	9.23	.22	2.24	2.66	2.34	18.86
2280	Columbia Guano Co., Norfolk, Va.	Columbia High Grade Special Tobacco Guano.	New Bern	R	5.85	2.55	8.40	.95	1.61	2.56	2.17	17.63
2248	Green & Yarboro, Louisburg, N. C.	Green& Yarboro's High Grade Fertilizer.	Louisburg	R	5.30	2.80	8.10	.89	2.31	3.20	2.82	19.99
1816	Navassa Guano Co., Wilmington, N. C.	Ammoniated Soluble Navassa Guano.	Wallace	D	5.28	2.42	7.70	1.08	2.00	3.08	2.36	18.77
2253	do	Navassa Guano for Tobacco.	Hiddenite	R	6.12	2.82	8.94	1.01	1.78	2.79	2.02	18.64
2005	Va.-Carolina Chemical Co, Richmond, Va.	Genuine Slaughter-house Bone Guano for Tobacco.	Scotland Neck	R	6.80	2.47	9.27	.99	2.03	3.02	1.93	19.52
2271	do	do	Pilot Mountain	D	5 65	3.08	8.73	1.51	1 22	2.73	2.14	18.40
	Brand claiming						8 00			2.75	2.00	17 65
1945	N. C. Cotton Oil Co., Raleigh, N. C.	Raleigh Standard Guano	Lucama	R	5.05	3.42	8.47	.48	2.46	2.94	2.19	18 85
	Brand claiming						8.00			2.25	2.50	16.70
2097	Reidsville Fertilizer Co., Reidsville, N. C.	Broad Leaf Tobacco Guano	Mebane	R	6.48	2.67	9.15	.87	1.46	2.33	2.77	18.27
	Brands claiming						8.00			2.50	2.50	17.45
2095	American Fertilizer Co., Norfolk, Va.	Bob White Fertilizer for Tobacco.	Mebane	R	6.38	1.78	8 16	.85	2.03	2.88	3 02	19 31
2304	do	do	Rocky Mount	N	7.28	2.07	9.35	.80	1.73	2.53	2.75	19.03
2149	Armour Fertilizer Works, Baltimore, Md.	Armour's Champion Fertilizer	Granville	R	6.38	2 21	8.59	.65	1.70	2.35	2.42	17.44
1886	Meadows, E. H. & J. A. Co., New Bern, N. C.	Meadows' All Crop Guano	LaGrange	R	4.85	4.41	9.26	1.60	1.67	3.27	4.29	22.86
	Brands claiming						8.00			2.75	2.50	18.20
1951	Hadley, J. C. & Co., Wilson, N. C.	Hadley's Boss Guano	Wilson	D	7.58	2.11	9.69	.75	2.13	2.88	2.77	20.41
1990	Va.-Carolina Chemical Co., Richmond, Va.	Delta	Fremont	D	5.53	2.65	8.18	.49	2.10	2.59	2.47	17.85
2302	do	do	Rocky Mount	R	7.40	1.82	9.22	.82	2.22	3.04	3.52	21.29
	Brand claiming						8.00			2.75	2.75	18.47
2161	Reidsville Fertilizer Co., Reidsville, N. C.	Royal Fertilizer	Reidsville	D	6 05	2.83	8.88	.74	2.22	2.96	3.17	20.36

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ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1902—Continued.

Laboratory No.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100. Water-Soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-Soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Potash.	Relative Value Per Ton at Factory.
	MIXED FERTILIZERS.											
	Brands claiming						8.00			2.00	3.00	$16.50
2089	Navassa Guano Co, Wilmington, N. C.	Harvey's King Soluble Guano	Aurora	R	6.75	1.24	7 99	.72	1.46	2.18	3.31	17.37
1830	Pocomoke Guano Co., Norfolk, Va.	Crescent Complete Compound	Magnolia	R	5.25	2.89	8.14	.91	1.30	2.21	3.14	17.41
	Brands claiming						8.00			2 50	3.00	18.00
1856	Acme Fertilizer Co., Wilmington, N. C.	Tip Top Tobacco Grower	Mount Olive	D	5.55	2.89	8.44	.64	2.02	2.66	3.27	19.17
2058	Atlantic Chem. Co, Norfolk, Va.	Atlantic Tobacco Grower	New Bern	R	5.35	3.12	8.47	.75	1.54	2.29	2.28	17.00
2171	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Caraleigh Special Tobacco Guano.	Wilson's Mills	R	7.10	2.07	9.17	.19	2 30	2.49	3.47	19.54
1931	do	Planters' Pride	Lumberton	R	5.22	2.39	7.61	.47	2.38	2.85	3.42	19.16
2086	Cowell, Swan & McCotter Co., Bayboro, N. C.	Cowell, Swan & McCotter Co.'s Potato Guano.	Bayboro	S	6.75	3.31	10.06	.68	1.96	2.64	3.79	21.14
2085	do	Cowell, Swan & McCotter Co.'s Quick Grower.	Bayboro	R	6.28	3.46	9.74	.67	1.95	2.62	4.09	21.12
2127	Farmers Guano Co., Raleigh, N. C.	Toco Tobacco Guano	Dunn	D	6.00	2.01	8.01	.31	2.41	2.72	3.69	19.43
2270	do	do	Pilot Mountain	S	6.58	2 58	9.16	.97	1.76	2.73	2.60	19.29
1921	Patapsco Guano Co., Baltimore, Md	Patapsco Special Tobacco Mixture.	New Bern	R	5.98	2.88	8.86	.82	1.96	2.78	2.97	19.58
2151	do	Unicorn Guano	Greenville	R	5.32	3.05	8.37	.55	2.17	2.72	3.13	19.13
2060	Piedmont-Mount Airy Guano Co., Baltimore, Md.	Piedmont Guano for Tobacco	New Bern	D	6.15	2.75	8.90	1.21	1.27	2.48	3.05	18.80
2277	do	do	Clyde	R	5.00	3.65	8.65	1.72	.86	2.58	3.16	19.00
2225	Pocahontas Guano Co., Lynchburg, Va.	Spot Cash Tobacco Compound	Thomasville	R	5.35	3.13	8.48	1.11	1.72	2.83	3.47	19.94
2272	do	do	Pilot Mountain	R	4.95	3.29	8 24	.49	2.88	3.37	3.63	21.52
1854	Royster, F. S., Guano Co., Norfolk, Va	Orinoco Guano	Mount Olive	S	4.90	4.44	9.34	.98	1.89	2.87	3.03	20.35
1918	do	Orinoco Tobacco Guano	New Bern	R	5.35	2.75	8.10	1.29	1.37	2.66	3 01	18.58
2177	Southern Chemical Co., Winston, N. C.	Pilot Ammoniated Guano, Special for Tobacco.	Reidsville	R	5.50	2.54	8.04	1.80	1.54	3.34	4.02	21.68
2188	Va.-Car. Chem. Co., Richmond, Va.	Blue Star	Smithfield	D	6.88	2.27	9.15	.82	1.86	2.68	3.84	20.50
1812	do	Carolina Golden Belt Ammoniated Guano for Tobacco.	Warsaw	D	7.05	1.79	8 84	.98	1 60	2.58	3.00	19.00
1866	do	Killikinnick Tobacco Mixture	New Bern	R	5.50	2.51	8.01	1.08	1.46	2.54	3.26	18.41

1819	Va.-Car. Chem. Co., Richmond, Va.	N. C. Official Farmers Alliance Guano.	Rose Hill	R	6.88	1.96	8.84	.85	1.66	2.51	3.29	19.10
1861	do	Osceola Tobacco Guano	New Bern	S	5.23	3.01	8.24	1.42	1.35	2.77	3.18	19.22
	Brands claiming						8.00			3.00	2.00	18.40
1979	MacMurphy, W. C. Co., Charleston, S. C.	Hardison's 8-3-2 Cotton and Corn Guano.	Wadesboro	R	6.80	1.36	8.16	.87	2.35	3.22	2.20	19.42
1966	Navassa Guano Co., Wilmington, N. C.	Navassa C. S. Meal Special 3 Per Cent Guano.	Laurinburg	R	5.90	2.28	8.18	1.37	2.25	3.62	2.41	20.87
2156	Va.-Car. Chem. Co., Richmond, Va.	Special 3 Per Cent Guano	Wilson	N	6.78	2.12	8.90	.71	2.17	2.88	2.16	19.03
1955	do	do	Wilson	R	5.93	2.34	8.27	1.77	1.19	2.96	2.40	18.96
	Brands claiming						8.00			3.00	2.50	18.95
2139	Acme Mfg. Co., Wilmington, N. C.	Acme Fertilizer	Wilmington	D	6.62	2.04	8.66	.38	2.80	3.18	2.47	20.05
1820	do	do	Burgaw	D	6.00	2.14	8.14	.17	2.75	2.92	2.34	18.66
1852	do	Acme Fertilizer for Tobacco	Washington	D	5.75	2.58	8.33	1.05	2.17	3.22	2.28	19.12
1953	Va.-Car. Chem. Co., Richmond, Va.	Atlas Guano	Wilson	D	7.38	1.81	9.19	1.87	1.34	3.21	3.17	21.39
2216	do	do	Wilson	D	6.90	2.24	9.14	.92	2.33	3.30	3.29	21.74
1928	do	Split Silk	Clinton	R	7.10	1.32	8.42	.61	2.69	3.30	2.60	20.34
	Brand claiming						8.00			4.00	2.50	21.95
1858	Va.-Car. Chem. Co., Richmond, Va.	Tinsley & Co.'s Tobacco Fertilizer.	Mount Olive	D	6.63	1.99	8.62	1.87	1.43	3.30	2.85	20.79
	Brand claiming						8.00			2.00	4.00	17.60
2254	Swift's Fert. Works, Atlanta, Ga.	Swift's Pioneer H. G. Tobacco Grower.	Alexander	D	6.32	3.68	10.00	1.36	2.04	3.40	5.29	25.02
	Brand claiming						8.00			2.50	4.00	19.10
1828	Navassa Guano Co., Wilmington, N. C.	Navassa Strawberry Top Dressing.	Magnolia	R	6.53	1.71	8.24	1.30	.84	2.14	5.67	20.08
	Brands claiming						8 00			3.00	3.00	19.50
2094	American Fertilizer Co, Norfolk, Va.	American Eagle Guano	Mebane	R	6.95	1.91	8.86	.62	2.47	3.09	3.19	20.75
2235	do	Blalock's High Grade Guano	Norwood	D	6.75	1.69	8.44	.91	2.13	3.04	3.12	20.15
2152	American Agricultural Chemical Co., New York, N. Y.	Lazaretto Special for Tobacco and Potatoes.	Greenville	R	6.62	2.21	8.85	1.06	2.01	3.07	3.10	20.57
2116	Armour Fertilizer Works, Baltimore, Md.	Armour's Cotton Special Fertilizer.	Monroe	R	7.25	1.25	8.50	1.24	1.78	3.02	3.01	20.02
1896	do	Armour's Tobacco Special 3-8-3 Fertilizer.	Kinston	R	1.85	5.98	7.83	1.09	2.11	3.20	3.23	20.20
2240	Bailey, J. L. & Co., Elm City, N. C.	Fairmont Guano	Elm City	R	5.42	3.54	8.96	.56	2.44	3.00	2.82	20.17
1842	Baugh & Sons Co., Norfolk, Va	Baugh's High Grade Tobacco Guano.	Washington	S	5.90	3.47	9.37	1.61	1.95	3.56	3.22	22.65
1807	do	Grand Rapid Guano	Faison	R	5.25	3.89	9.14	1.73	1.47	3.20	3.31	21.47
1895	Columbia Guano Co., Norfolk, Va.	Hyco Tobacco Guano	Kinston	R	6.18	2.67	8.85	1.19	1.82	3.01	3.32	20.54
1848	Farmers Guano Co., Raleigh, N. C.	Golden Grade Guano	Washington	R	5.28	2.71	7.99	.79	2.35	3.14	3.61	20.58
2306	do	do	Kinston	D	5.52	2.14	7.96	.75	2.75	3.50	3.80	21.84
1920	Imperial Company, Norfolk, Va.	Imperial Tobacco Guano	Greenville	R	5.88	2.11	7.99	1.24	2.02	3.26	3 51	20.83
1888	Meadows, E. H. & J. A. Co., New-Bern, N. C.	Meadows Gold Leaf Tobacco Guano.	LaGrange	D	5.13	3.80	8.93	1.80	1.82	3.62	3.98	23.27

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ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1902—Continued.

Laboratory No.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100.							Relative Value Per Ton at Factory.
					Water-Soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-Soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Potash.	
	MIXED FERTILIZERS.											
	Brands claiming						8.00			3.00	3.00	$19.50
1822	Navassa Guano Co., Wilmington, N. C.	Clarendon Tobacco Guano	Whiteville	R	5.65	2.47	8.12	1.61	1.02	2.63	3.26	18.78
2249	Ober, G. & Sons Co, Baltimore, Md.	Ober's Special Compound for Tobacco.	Louisburg	D	8.82	.87	9.69	2.10	1.36	3.46	3.25	22.67
2187	Piedmont-Mt. Airy Guano Co., Baltimore, Md.	Levering's Reliable Tobacco Guano.	Smithfield	R	6.15	3.35	9.50	1.38	1.76	1.76	3.01	21.28
1917	Pocomoke Guano Co., Norfolk, Va.	Harvey's High Grade Monarch	New Bern	R	6.45	1.68	8.13	1.00	2.05	3.05	3.24	20.03
2184	do	Monarch Tobacco Grower	Magnolia	R	6.10	2.27	8.37	1.62	1.82	3.44	3.92	22.16
2118	Powhatan Chem. Co., Richmond, Va.	P. C. Co.'s Hustler	Charlotte	R	6.48	3.25	9.73	.67	2.47	3.14	3.05	21.53
1844	Richmond Guano Co., Richmond, Va.	Gilt Edge Fertilizer	Washington	R	5.13	3.23	8.36	.97	2.46	3.43	3.39	21.54
2157	do	do	Wilson	D	6.35	3.31	9.66	.63	2.32	2.95	3.23	21.10
2268	do	do	Pilot Mountain	R	6.90	2.95	9.85	.46	2.38	2.84	2.73	20.38
2211	Va.-Car. Chem. Co, Richmond, Va.	Amazon High Grade Manure	Varina	R	6.58	1.52	8.10	1.86	.90	2.76	3.61	19.54
1833	do	Bright Leaf Tobacco Grower	Mount Olive	R	6.00	2.42	8.42	1.10	1.94	3.04	3.44	20.48
2266	do	do	Mount Airy	R	5.52	3.18	8.70	.66	2.24	2.90	3.04	19.87
1949	do	Farmers Friend High Grade Fertilizer.	Oriental	R	6.03	2.28	8.31	1.82	1.68	3.50	3.62	21.96
1868	do	Farmers Friend Special Tobacco Fertilizer.	New Bern	R	5.60	2.41	8.01	1.62	1.18	2.80	3.04	18.95
1946	do	Golden Leaf Bright Tobacco Guano.	Lucama	R	4.70	2.48	7.18	1.25	1.98	3.23	2.90	19.34
2314	do	Gold Medal Brand Guano	Franklinton	R	6.62	2.24	8.86	.76	2.65	3.41	2.89	21.38
1935	do	Special High Grade Fertilizer for Tobacco.	Lumberton	R	4.82	4.22	9.04	.76	2.46	3.22	3.14	21.25
2106	Va. State Fertilizer Co., Lynchburg, Va.	Dunnington's Speci'l Formula for Tobacco.	Williamston	D	6.65	2.47	9.12	.66	2.56	3.22	3.07	21.24
2262	do	do	Springhope	R	6.92	3.58	10.50	.90	2.40	3.30	3.00	22.65
	Brands claiming						8.00			3.00	4.00	20.61
1902	Va.-Car. Chem. Co., Richmond, Va.	Grooms' Special Tobacco Fertilizer.	Lumberton	R	4.53	3.50	8.03	.71	2.36	3.07	4.98	21.91
2265	do	do	Springhope	R	6.48	2.27	8.75	.74	2.62	3.36	3.70	22.02
	Brand claiming						8.00			3.50	6.00	24.30
2148	Armour's Fertilizer Works, Baltimore, Md.	Armours' Little Sam Big Tobacco Grower.	Greenville	D	7.60	2.20	9.80	1.63	1.19	2.82	4.98	22.76

	Brand claiming						8.00			4.00	3.00	22.50
2003	Va.-Car. Chem. Co., Richmond, Va.	Capital Tobacco Fertilizer	Granville	R	4.50	3.70	8.20	.93	3.51	4.44	3.51	24.56
	Brands claiming						8.00			4.00	4.00	23.60
1932	Navassa Guano Co., Wilmington, N. C.	Coree Tobacco Guano	New Bern	D	6.25	2.23	8.48	2.79	1.24	4.03	4.10	24.23
2151	do	do	Arapahoe	D	7.18	2.15	9.33	2.74	1.21	3.95	4.30	24.98
2252	Royster, F. S., Guano Co., Norfolk, Va.	McLain's Special Guano	Hiddenite	S	5.30	3.00	8.30	1.94	1.73	3.67	4.61	23.55
2166	Swift's Fertilizer Works, Atlanta, Ga.	Swift's Monarch High Grade Guano.	Charlotte	R	4.05	4.22	8.27	2.13	2.04	4.17	3.77	24.10
	Brands claiming						8.00			4.00	5.00	24.70
1937	Etiwan Fertilizer Co., Charleston, S. C.	Etiwan Vegetable Fertilizer	Maxton	D	6.75	1.43	8.18	.89	3.48	4.37	5.74	26.79
2030	Va.-Car. Chem. Co., Richmond, Va.	Truck Farmers' Special Ammoniated Guano.	Fayetteville	D	6.48	1.45	7.93	1.68	2.12	3.80	5.65	24.75
	Brands claiming						8.00			5.00	3.00	25.50
1906	Va.-Car. Chem. Co., Richmond, Va	Special Plant and Truck Fertilizer.	Belcross	R	5.85	2.68	8.53	2.74	2.30	5.04	3.51	26.66
2153	do	do	Arapahoe	D	6.68	1.93	8.61	3.75	1.71	5.46	3.71	28.21
	Brands claiming						8.00			5.00	5.00	27.70
2061	Meadows, E. H. & J. A. Co., New Bern, N. C.	Meadows Laboss Guano	Newport	R	6.05	2.90	8.95	2.79	2.27	5.06	5.04	28.78
1912	Va.-Car. Chem. Co., Richmond, Va.	Norfolk Truck and Tomato Grower.	Elizabeth City	R	6.15	2.15	8.30	2.79	2.01	4.80	5.18	27.57
1881	do	Virginia Trucker	do	R	6.38	2.04	8.42	2.64	2.35	4.99	4.88	27 92
	Brand claiming						8.00			5.00	7.00	29.90
2138	Armour's Fertilizer Works, Baltimore, Md.	Armour's Blood, Bone and Potash.	Wilmington	R	6.72	1.99	8.71	1.28	4.04	5.32	7.37	31.90
	Brands claiming						8.50			2.00	2.00	15.85
2160	Acme Manufacturing Co., Wilmington, N. C.	Acme Special Grain Fertilizer	Reidsville	D	6.75	2.43	9.18	.04	1.83	1.87	2.12	16.20
2093	do	Gem Fertilizer	Hillsboro	D	7.42	1.61	9.03	.37	1.70	2.07	1.75	16.26
1977	Ashepoo Fertilizer Co., Charleston, S. C.	Eutaw XX Guano	Monroe	D	7.33	2.11	9.44	.76	1.68	2.44	2.22	18.26
1968	Pocomoke Guano Co., Norfolk, Va.	Electric Crop Grower	Southern Pines	R	6.80	2.66	9.46	.92	1.16	2.08	2.07	17.03
	Brands claiming						8.50			2.75	2.00	18.10
1943	Va.-Car. Chem. Co., Richmond, Va.	Allison & Addison's Anchor Brand Tobacco Fertilizer.	Bagley	D	5.48	3.28	8.76	1.88	1.36	3.24	2.50	20.35
2276	do	do	Marshall	R	7.05	2.11	9.16	2.06	1.48	3.54	2.03	21.10
	Brands claiming						8.50			2.50	2.50	17.90
2186	Pocomoke Guano Co., Norfolk, Va.	Cinco Tobacco Guano	Warsaw	R	5.43	3.61	9.04	.78	1.93	2.71	3.00	19.57
2257	do	do	Mt. Airy	R	6.02	2.86	8.88	.62	2.06	2.68	2.98	19.31
	Brand claiming						8.50			3.00	2.50	19.40
2259	American Agricultural Chemical Co., New York, N. Y.	Reese's Pacific Guano for Tobacco.	Reidsville	R	6.25	3.71	9.96	1.38	2.41	3.79	2.67	23.27
	Brands claiming						9.00			2.25	1.00	15.95
2082	Ashepoo Fertilizer Co., Charleston, S. C.	Ashepoo Fertilizer	Davidson		7.52	2.74	10.26	1.28	1.18	2.46	1.57	18.34

N, D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1902.

Mixed Fertilizers.

Laboratory No.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100. Water-Soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-Soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Potash.	Relative Value Per Ton at Factory.
	Brands claiming						9.00			2.25	1.00	$15.95
1942	Bradley Fertilizer Co., Charleston, S. C.	Bradley's Patent Superphosphate.	Bagley	D	6.48	3.08	9.56	.71	1.75	2.46	1.44	17.57
1857	do	Sea Fowl Guano	Mount Olive	D	4.00	4.88	8.88	1.28	1.04	2.32	1.37	16.46
1944	Quinnipiac Co., Charleston, S. C.	Quinnipiac Pine Island Ammoniated Phosphate.	Bagley	D	6.38	3.21	9.59	.92	1.68	2.60	1.46	18.04
	Brands claiming						9.00			2.00	2.00	16.30
2197	Benton, J. A., Ruffin, N. C.	N C. Bright Tobacco Fertilizer	Ruffin	S	5.68	4.22	9.90	.48	1.74	2.22	2.19	17.98
1982	Etiwan Fertilizer Co., Charleston, S. C.	Standard Grade Ammoniated Dissolved Bone.	Wadesboro	D	8.42	1.42	9.84	.68	1.47	2.15	2.22	17.95
2010	Ober, G. & Sons Co., Baltimore, Md.	Ober's Special Ammoniated Dissolved Bone.	Concord	R	9.88	1.19	11.07	.65	1.70	2.35	2.00	19.21
2193	Piedmont-Mt. Airy Guano Co., Baltimore, Md.	Piedmont Essential Tobacco Compound.	Leaksville	R	6.78	3.41	10.19	1.45	.94	2.39	2.30	18.87
2196	Pocahontas Guano Co., Lynchburg, Va.	Yellow Tobacco Special	Ruffin	R	6.73	2.85	9.58	.62	1.52	2.14	2.07	17.32
2228	do	Standard Tobacco Guano	Kernersville	R	6.45	3.46	9.91	.42	2.07	2.49	3.80	20.57
2023	Va.-Car. Chem. Co., Norfolk, Va.	Standard Guano	Cherryville	R	7.60	1.52	9.12	.32	2.44	2.76	1.81	18.48
	Brands claiming						9.00			2.75	2.00	18.55
1884	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Pacific Tobacco and Cotton Grower.	LaGrange	R	6.38	2.83	9.21	.49	2.46	2.95	2.44	19.82
1827	Va.-Car. Chemical Co, Richmond, Va.	Prolific Cotton Grower	Magnolia	D	7.10	1.75	8.85	.46	2.26	2.72	2.41	18.77
2231	do	do	Nashville	R	7.12	2.31	9.43	.89	2.20	3.09	2.81	20.85
	Brands claiming						9.00			2.50	1.50	17.25
2311	Lynchburg Guano Co., Lynchburg, Va.	Parker & Harris' Special Tobacco Compound.	Oxford	R	7.08	2.82	9.90	.75	1.96	2.71	1.76	18.98
2312	Parker & Hunt, Oxford, N. C.	Parker & Hunts' Special Tobacco Compound.	do	D	7.18	3.41	10.59	.76	1.91	2.67	1.54	19.23
	Brands claiming						9.00			2.75	1.50	18.00
2046	Va.-Carolina Chemical Co., Richmond, Va.	Allison & Addison's Star Brand Tobacco Manure.	Durham	R	6.40	2.25	8.65	1.56	1.73	3.29	2.14	20.01
2284	do	do	High Point	R	6.58	3.40	9.98	1.09	1.85	2.94	1.82	19.80

	Brands claiming						9.25			2.50	2.00	18.02
1804	Patapsco Guano Co., Baltimore, Md.	Patapsco Guano	Faison	R	6.20	3.16	9.36	.87	1.69	2.56	2.21	18.53
2200	Wariner, W. H. & Co., Ruffin, N. C.	North Carolina Special	Ruffin	R	6.50	2.62	9.12	1.15	1.62	2.77	2.45	19.21
	Brands claiming						9.00			2.50	2.00	19.80
2258	Va.-Carolina Chemical Co, Richmond, Va.	Eureka Ammoniated Bone, Special for Tobacco.	Reidsville	R	6.22	2.13	8.35	.96	1.82	2.78	2.67	18.79
1941	do	Owl Brand Special Tobacco Guano.	Selma	D	6.68	2.18	8.86	1.55	1.06	2.61	2.06	18.07
	Brands claiming						9.00			3.00	2.00	19.30
2076	Swift Fertilizer Works, Atlanta, Ga	Cotton King High Grade Guano	Lawndale	R	7.00	2.86	9.86	.76	2.20	2.96	2.34	20.33
2189	Va.-Carolina Chemical Co., Richmond, Va.	L. and M. Special Guano	Raleigh	R	7.13	1.87	9.00	1.49	1.60	3.09	2.24	19.83
1832	do	Standard Cotton-seed Meal Guano.	Mount Olive	D	7.20	2.27	9.47	.60	2.47	3.07	1.89	19.81
	Brand claiming						9.00			2.50	5.00	21.10
2195	Va.-Carolina Chemical Co., Richmond, Va.	Sun Brand Guano	Ruffin	R	7.15	2.33	9.48	.75	1.90	2.65	3.34	20.16
	Brand claiming						9.00			3.00	2.25	19.57
2190	Columbia Guano Co., Norfolk, Va.	Special Ammoniated Fertilizer	Raleigh	R	6.40	3.08	9.48	1.21	1.84	3.05	2.35	20.27
	Brands claiming						9.00			3.00	3.00	20.40
2199	American Fert. Co., Norfolk, Va.	Miller & Co.'s Yellow Leaf Fertilizer.	Ruffin	R	7.53	1.61	9.14	.91	2.12	3.03	3.00	20.62
1803	Patapsco Guano Co., Baltimore, Md.	Patapsco Tobacco Fertilizer	Faison	D	7.63	2.16	9.79	1.66	1 34	3.00	3.10	21.22
2226	Pocahontas Guano Co., Lynchburg, Va.	Pocahontas Special Tobacco Fertilizer.	Thomasville	R	6.98	2.45	9.43	1.07	2 28	3.35	3.52	22.41
	Brands claiming						9.00			3.50	5 00	24.10
2150	American Fert. Co., Norfolk, Va.	Pitt County Special Fertilizer for Yellow Leaf Tobacco.	Greenville	R	7.08	1.91	8.99	.94	2.64	3.58	5.68	25.08
2185	do	Special Formula for Yellow Leaf Tobacco.	Clinton	D	7.68	2.79	10.47	2.24	.91	3.15	4.68	24.02
2264	do	do	Springhope	R	7.08	1.84	8.92	.81	2 93	3.74	5.72	25.54
	Brands claiming						9.00			3.00	6.00	23.70
2194	Powhatan Chemical Co., Richmond, Va.	Groom's High Grade Tobacco Fertilizer.	Greensboro	D	7.58	3.52	11.10	.80	2.71	3.51	5.62	26.70
2179	Reidsville Fertilizer Co., Reidsville, N. C.	Lion Brand Fertilizer	Reidsville	R	7.13	3.10	10.23	.93	2.21	3.14	6.58	25.86
	Brand claiming						10.00			2.50	3.00	19.80
2250	Vann, S. C., Franklinton, N. C.	Pilot Guano, Special Compound	Franklinton	R	8 02	2.66	10.68	1.20	1.72	2.92	3.33	22.03
	Brand claiming						10.00			2.50	4.00	20.90
2251	Vann, S. C., Franklinton, N. C.	Pilot Guano, Special 4 Per Cent.	Franklinton	R	8.68	2.26	10.94	1.23	1.73	2.96	3.88	22.99
	Brand claiming						10.00			5.00	8.00	32.80
1936	Atlantic Chemical Co., Norfolk, Va.	McCaskell's High Grade Guano	Maxton	D	7.15	3.09	10.24	3.83	.98	4.81	8.10	32.56
	Brand claiming						11.00			3.00	4 00	23.30
2117	Va.-Carolina Chemical Co., Richmond, Va.	Oliver's Perfect Wheat Fert.	Charlotte	R	6.58	1.09	7.67	.31	3.60	3.91	3.99	23.02

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ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1902—Continued.

Laboratory No.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100. Water-Soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-Soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Potash.	Relative Value Per Ton at Factory.
	Mixed Fertilizers.											
	Brand claiming						4.00			4.00	6 00	$22.20
2104	Imperial Company, Norfolk, Va.	Imperial Pitt County Special Tobacco Fertilizer.	Jamesville	R	2.98	2.16	5.14	1.71	3.66	5.37	5.60	26.90
	Brands claiming						5.00			10.00	2.50	37 25
1811	Baugh & Sons Co., Norfolk, Va.	Baugh's New Process Ten Per Cent Guano.	Faison	S	4.33	2.18	6.51	7.75	2.27	10.02	3.39	39.65
1869	Va.-Carolina Chemical Co., Richmond, Va.	Tinsley's Ten Per Cent Truck Guano.	New Bern	R	3.18	2.47	5 65	7.75	2.13	9.88	3.00	38.02
	Brands claiming						6.00			4 00	4.00	21.80
1927	Home Fertilizer Chemical Works, Baltimore, Md.	Home Potato Grower	Clinton	R	5.05	2 65	7.70	2.12	1 76	3.88	4 34	23.34
1813	Va.-Carolina Chemical Co., Richmond, Va.	Tinsley's Strawberry Grower	Warsaw	R	4.50	1.70	6.20	1.28	3 06	4 34	4.57	23.63
	Brands claiming						6.00			5 00	5.00	25.90
2137	Armour Fertilizer Works, Baltimore, Md.	Armour's H. G. Manure for Light Soil.	Wilmington	R	4.85	2.65	7.50	3.64	1.48	5.12	5.45	28.10
1907	Imperial Company, Norfolk, Va	Williams' Special PotatoGuano	Camden	R	4.15	2.35	6.50	1.79	3.21	5.00	5.34	26.72
	Brands claiming						6.00			5.00	7.00	28.10
1877	American Fertilizer Co., Norfolk, Va.	Special Potato Manure	Elizabeth City	S	4.90	2.34	7.24	2 84	2.21	5.05	7.08	29.45
1806	Baugh & Sons Co., Norfolk, Va.	Baugh's Peruvian Guano Substitute.	Faison	R	3.33	3.55	6.88	2.67	1.91	4.58	6.99	27.62
1841	do	do	Washington	S	4.33	3.16	7.49	3.34	2.00	5.34	7.07	30.54
	Brand claiming						6.00			5.50	7.00	29.60
1910	Miller Fertilizer Co., Baltimore, Md	High Grade Potato Guano	Elizabeth City	R	3.70	2.38	6.08	3.10	3.00	6 10	8.64	33.28
	Brands claiming						6.00			7.00	5.00	31.90
1847	American Agricultural Chemical Works, New York, N. Y.	Trucker's Favorite for Promoting Quick Growth.	Washington	R	4.58	2.20	6.78	3.87	2.64	6.51	4.86	30.98
1880	Baugh & Sons Co., Norfolk, Va.	Baugh's Seven Per Cent Potato Guano.	Elizabeth City	R	3.08	4.39	7.47	4.95	2.15	7.10	5.20	33.74
1908	Pocomoke Guano Co., Norfolk, Va.	Freeman's Seven Per Cent Irish Potato Grower.	do	S	4.68	1.80	6.48	2.18	4.70	6.88	5.32	32.32

	Brand claiming						6.00			6.00	6.00	30.00
1859	Va.-Carolina Chemical Co., Richmond, Va.	Tinsley's Irish Potato Guano	Mount Olive	D	5.08	2.17	7.25	2.26	2.10	4.36	4.56	24.62
	Brand claiming						7.00			4.00	7.00	26 00
2088	Cowell, Swann & McCotter Co., Bayboro, N. C.	Cowell, Swann & McCotter Co.'s Potato Favorite Guano.	Bayboro	D	4.88	4.86	9.74	1.49	3.07	4.56	8.58	31 88
	Brands claiming						7.00			5.00	5.00	26.80
1839	American Agricultural Chemical Works, New York, N. Y.	Early Trucker for Promoting Quick Growth.	Washington	R	5.78	2.32	8.10	1.23	4.15	5.38	5.01	28.94
1909	Pocomoke Guano Co., Norfolk, Va.	Standard Truck Guano	Elizabeth City	R	4.65	3.83	8.48	1.03	4.05	5.08	5.42	28.83
	Brands claiming						7.00			5.00	8.00	30.10
1840	American Agricultural Chemical Co., New York, N. Y.	Pamlico Trucker	Washington	S	6.03	1.84	7.87	2.18	3.08	5.26	8.23	31.91
1876	Va.-Carolina Chemical Co., Richmond, Va.	Old Dominion Potato Manure	Hertford	R	5.40	1.94	7.34	2.75	2.06	4.81	8.31	30.18
1887	Meadows, E. H. & J. A. Co., New Bern, N. C.	Meadows' Great Potato Guano	LaGrange	R	4.20	3.74	7.94	2.42	2.62	5.04	8 15	31.23
	Brand claiming						7.00			7.00	5.00	32.80
1878	American Fertilizer Co., Norfolk, Va.	Standard Seven Per Cent Ammonia Guano.	Elizabeth City	R	5.95	2.72	8.67	4.01	2.56	6.57	5.00	33.01
	Brand claiming						10.00				1.00	9.10
2220	Va.-Carolina Chemical Co., Richmond, Va.	Quick Step Soluble Bone and Potash.	Winston	D	6.13	3.78	9.91				1.72	10.81
	Brand claiming						10.00				1.50	10.65
2133	Va.-Carolina Chemical Co., Richmond, Va.	Great Wheat and Corn Grower	Burlington	D	6.20	2.96	9.16				1.63	10.04
	Brands claiming						10.00				2.00	11.20
2285	American Fertilizer Co., Norfolk, Va.	Dissolved Bone and Potash for Corn and Wheat.	Albemarle	D	7.85	3.25	11.10				2.36	12.59
2071	American Fertilizer Co., Norfolk, Va.	Dissolved Bone and Potash Guano.	Albemarle	D	8.45	2.14	10.59				2.46	12.24
2013	Armour Fertilizer Works, Baltimore, Md.	Armour's Phosphate and Potash No. 1 Fertilizer.	Monroe	R	6.58	4.12	10.70				2.18	12.03
2051	Ashepoo Fertilizer Co., Charleston, S. C.	Enoree Acid Phosphate	Charlotte	D	6.32	5.34	11.66				2.02	12.72
2077	Atlantic Chemical Co., Norfolk, Va.	Atlantic Bone and Potash Mixture.	Ellenboro	R	6.08	3.48	9.56				1.72	10.50
2172	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Electric Bone and Potash Mixture.	Wilson's Mills	R	8.10	4.29	12.39				1.76	13.09
2158	Columbia Guano Co., Norfolk, Va.	Columbia Bone and Potash	Four Oaks	D	6.20	4.19	10.39				1.56	11.07
2300	do	do	Troy	R	6.15	4.29	10.44				1.14	10.65
2288	Farmers Guano Co., Wilmington, N. C.	Century Bone and Potash Mixture.	Liberty	D	9.40	3.07	12.47				1.60	12.98
2134	do	do	Elon College	N	8.85	2.08	10.93				1.87	11.98

N, D. R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1902—Continued.

Laboratory No.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100. Water-Soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-Soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Potash.	Relative Value Per Ton at Factory.
	MIXED FERTILIZERS.											
	Brands claiming						10.00				2.00	$11.20
2067	Lynchburg Guano Co., Lynchburg, Va.	Lynchburg Dissolved Bone and Potash.	Oxford	R	5.62	5.12	10.74				1.88	11.73
2007	MacMurphy, W. C. Co., Charleston, S. C.	Acid Phosphate and Potash	Monroe	R	7.90	2.17	10.07				2.22	11.50
2026	Navassa Guano Co., Wilmington, N. C.	Navassa Dissolved Bone with Potash.	Shelby	R	7.50	3.39	10.89				2.16	12.18
2020	Patapsco Guano Co., Baltimore, Md.	Patapsco Soluble Bone and Potash.	Lowell	D	7.68	3.69	11.37				2.34	12.81
2062	Piedmont-Mt. Airy Guano Co., Baltimore, Md.	Piedmont Farmers High Grade Bone and Potash.	New Bern	D	5.18	5 57	10.75				2.19	12.08
2144	Powhatan Chemical Co., Richmond, Va.	Bone and Potash Mixture	Greensboro	D	7.50	3.63	11.13				2.14	12.37
2295	do	do	Severn	R	5.00	5.51	10.51				1.92	11.57
2317	do	do	Franklinton	N	10.72	3.58	14.30				3.75	16.99
2052	Royster, F. S., Guano Co., Norfolk, Va.	Royster's Bone and Potash Mixture.	Pineville	D	7.33	2.54	9 87				1.85	10.92
2143	Va.-Carolina Chemical Co., Richmond, Va.	Allison & Addison's B. P. Potash Mixture.	Lenoir	D	5.70	4.35	10.05				2.08	11.33
2210	do	Blue Ridge H. G. Phosphate with Potash.	Salisbury	R	7.68	2.69	10.37				2.33	11.89
2274	do	do	Mount Airy	R	5.55	2.85	8.40				2.37	10.17
2069	do	Capital Bone and Potash Compound.	Roxboro	R	8.68	1.86	10.54				2.21	11.92
2218	do	Durham Bone and Potash Mixture.	Stokesdale	D	5.75	3.55	9.30				2.01	10.58
2042	do	Eureka Bone and Potash Compound.	Charlotte	D	7.12	3.03	10.15				1.65	10.95
1993	do	Dissolved Bone and Potash	Goldsboro	D	8.50	1.78	10.28				1.82	11.25
2012	do	High Grade Alkaline Bone and Potash.	Monroe	N	6.58	3.59	10.17				2.10	11.46
2278	do	Mammoth Corn Grower	Hendersonville	R	6.02	3.53	9.55				2.15	10.96
2168	do	do	Mooresville	R	6.28	3.28	9.56				2.21	11.03
2275	do	do	Pilot Mountain	R	6.30	2.92	9.22				1.97	10.46

2070	Va.-Car. Chem. Co., Richmond, Va.	Mammoth Wheat and Grass Grower.	Salisbury	S	6.92	2.59	9.51				2.90	11.75
2078	do	Ten and Two Per Cent Bone and Potash.	Lattimer	D	6.82	3.43	10.25				2.54	12.02
2241	do	Tinsley's Bone and Potash Mixture.	Springhope	N	7.90	1.93	9.83				2.20	11.27
2111	do	Winston Bone and Potash Compound.	Statesville	R	7.68	2.59	10.27				1.88	11.25
2164	Virginia State Fertilizer Co., Lynchburg, Va.	H. G. Dissolved Bone and Potash.	Lawrence	R	6.10	4.34	10.44				2.13	11.74
	Brands claiming						10.00				3.00	12.30
2227	Acme Mfg. Co., Wilmington, N. C.	Acme Bone and Potash	Ashboro	D	7.38	2.76	10.14				3.01	12.44
2180	Va.-Car. Chem. Co., Richmond, Va.	Diamond Wheat Manure	Reidsville	D	4.43	4.74	9.17				3.07	11.63
2025	do	Planters Bone and Potash Mixture.	Shelby	R	8.22	2.35	10.57				3.39	13.24
	Brand claiming						10.00				4.00	13.40
2181	Va.-Car. Chem. Co., Richmond, Va.	Winner Grain Mixture	Reidsville	R	7.83	2.86	10.69				3.78	13.78
	Brand claiming						11.00				2.00	12.10
2219	Pocomoke Guano Co., Norfolk, Va	Alkali Bone	Madison	R	8.88	3.13	12.01				2.14	13.16
	Brands claiming						11.00				5.00	15.40
2173	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Horne & Sons H. G. Bone and Potash.	Clayton	D	8.43	5.26	13.69				4.20	16.94
1929	Patapsco Guano Co., Baltimore, Md	Patapsco High Grade Bone and Potash.	New Bern	D	7.98	3.41	11.39				5.07	15.83
	Brand claiming						12.00				3.00	14.10
2100	Va.-Car. Chem. Co., Richmond, Va.	Reaper Grain Application	Graham	R	9.00	2.60	11.60				2.44	13.12
	Brands claiming						12.00				4.00	15.20
2174	Navassa Guano Co., Wilmington, N. C.	Navassa Gray Land Mixture	Clayton	D	9.25	1.69	10.94				4.72	15.04
2316	do	Navassa Special Wheat Mixture.	Franklinton	D	9.38	1.73	11.11				4.37	14.80
	Brands claiming						8.00				4.00	11.60
2287	Va.-Car. Chem. Co., Richmond, Va.	Carr's Special Wheat Grower	Randleman	R	5.18	3.50	8.68				3.60	11.77
2286	do	Traver's Special Wheat Compound.	do	R	5.92	2.38	8.30				3.72	11.57
	Brand claiming						8.00				2.25	9.67
2068	Va.-Car. Chem. Co., Richmond, Va.	Allison & Addison's McGavock's Spe. Potash Mixture.	Roxboro	R	6.92	2.24	9.16				2.22	10.70
	Brand claiming						8.00				3.00	10.50
2163	Va.-Car. Chem. Co., Richmond, Va.	McCrary's Dissolved Bone and Potash.	Statesville	D	6.08	3.74	9.82				3.34	12.51
	Brand claiming						8.50				2.00	9.85
2024	Va.-Car. Chem. Co., Richmond, Va.	Old Dominion Dissolved Bone and Potash.	Waco	D	7.62	1.71	9.33				1.50	10.05

N, D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

ANALYSES OF COMMERCIAL FERTILIZERS--SPRING SEASON, 1902—Continued.

Laboratory No.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100. Water-Soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-Soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Potash.	Relative Value Per Ton at Factory.
	Brand claiming						8.50				2.00	9.85
2243	Virginia State Fertilizer Co., Lynchburg, Va.	Gilt Edge Dissolved Bone and Potash.	Mocksville	R	4.92	3.58	8.50				1.78	9.61
	Brand claiming									9.00	2.50	29.75
1930	Home Fertilizer Chemical Works, Baltimore, Md.	Cerealite Top Dressing	Clinton	S				8.44		8.44	4 28	30.03
	RAW OR UNMIXED FERTILIZER MATERIALS											
	Brands claiming						10.00					$8.00
2135	Richmond Guano Co., Richmond, Va.	Old Homestead Dissolved Bone.	Burlington	D	7.35	4.58	11.93					9.54
2102	Va.-Car. Chem. Co., Richmond, Va.	Almont Acid Phosphate	Graham	D	8.00	3.23	11.23					8.98
2041	do	Catawba Acid	Charlotte	R	9.55	2.28	11.83					9.46
2245	do	Champion Acid Phosphate	Wilkesboro	D	6.28	3.38	9.66					7.73
2289	do	Durham Acid Phosphate	Albemarle	R	5.62	4.88	10.50					8.40
2244	do	do	Mocksville	R	8.98	2.85	11.83					9.46
2221	do	Norfolk Reliable Acid Phosphate.	Winston	R	5.90	3.99	9.89					7.91
2229	do	Tinsley's Stonewall Brand Acid Phosphate.	do		5.63	4.24	9.87					7.90
	Brands claiming						12.00					9.60
2169	Atlantic Chem. Co., Norfolk, Va.	Atlantic Acid Phosphate	Mooresville	R	6.95	4.66	11.61					9.29
2031	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Staple Acid Phosphate	Concord	D	11.65	2.74	14.39					11.51
2237	Columbia Guano Co., Norfolk, Va.	Columbia Acid Phosphate	Albemarle	D	6.40	4.79	11.19					8.95
1826	Navassa Guano Co., Wilmington, N. C.	Navassa Acid Phosphate	Whiteville	D	10.85	2.80	13.65					10.92
2073	Royster, F. S., Guano Co., Norfolk, Va.	High Grade XX Acid Phosphate	Albemarle	N	6.85	5.15	12.00					9.60
2022	Swift Fertilizer Works, Atlanta, Ga.	Swift's Chattahoochee Standard Grade Acid Phosphate.	Kings Mountain	N	8.78	4.21	12.99					10.39
2017	Va.-Car. Chem. Co., Richmond, Va.	Allison & Addison's Standard Acid Phosphate.	Monroe	D	10.52	2.13	12.65					10 12
2310	do	do	Wilkesboro	D	8.65	3.60	12.25					9.80
2162	do	Capital Dissolved S. C. Bone	Reidsville	D	7.65	5.10	12.75					10.20

2028	Va.-Carolina Chemical Co., Richmond, Va.	Owl Brand Acid Phosphate	Waco	D	11.62	2.04	13.66	----	----	----	----	10.93
1971	----do	Royster's High Grade Acid Phosphate.	Sanford	D	9.98	3.10	13.08	----	----	----	----	10.46
2238	Virginia State Fertilizer Co., Lynchburg, Va.	Alps Brand Acid Phosphate	Albemarle	R	9.15	4.96	14.11	----	----	----	----	11.29
	Brands claiming											
2141	Acme Mfg. Co., Wilmington, N. C.	Acme Acid Phosphate	----	----	----	----	13.00	----	----	----	----	10.40
2236	American Fertilizer Co., Norfolk, Va.	Eagle High Grade Phosphate	Wilmington	N	11.88	2.28	14.16	----	----	----	----	11.33
			Norwood	D	12.32	2.59	14.91	----	----	----	----	11.93
1994	Armour Fertilizer Works, Baltimore, Md.	Armour's Acid Phosphate	Goldsboro	D	11.85	2.27	14.12	----	----	----	----	11.30
2053	Ashepoo Fertilizer Works, Charleston, S. C.	Ashepoo XXX Acid Phosphate	Charlotte	R	10.98	3.51	14.49	----	----	----	----	11.59
1997	----do	Carolina Acid Phosphate	Monroe	D	10.73	3.76	14.49	----	----	----	----	11.59
2079	Atlantic Chem. Co., Norfolk, Va.	Atlantic Dissolved Bone	Rutherfordton	D	8.50	5.34	13.84	----	----	----	----	11.07
1948	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Sterling High Grade Acid Phosphate.	Selma	D	8.98	3.98	12.96	----	----	----	----	10.37
2112	Columbia Guano Co., Norfolk, Va.	Columbia Dissolved Bone	Norwood	D	6.95	6.30	13.25	----	----	----	----	10.60
2114	Etiwan Fertilizer Co., Charleston, S. C.	Etiwan Dissolved Bone	Mooresville	D	9.82	3.01	12.83	----	----	----	----	10.26
2113	Farmers Guano Co., Raleigh, N. C.	Farmers High Grade Acid Phosphate.	Norwood	D	8.62	5.08	13.70	----	----	----	----	10.96
2080	Lynchburg Guano Co., Lynchburg, Va.	Arvonia Acid Phosphate	Rutherfordton	D	7.70	5.84	13.54	----	----	----	----	10.83
1984	MacMurphy, W. C. Co., Charleston, S. C.	High Grade Acid Phosphate	Wadesboro	N	10.18	2.96	13.14	----	----	----	----	10.51
1825	Navassa Guano Co., Wilmington, N. C.	Navassa High Grade Dissolved Bone.	Whiteville	D	9.35	3.22	12.57	----	----	----	----	10.06
2222	Powhatan Chemical Co., Richmond, Va.	Powhatan Acid Phosphate	China Grove	N	8.18	5.03	13.21	----	----	----	----	10.57
2015	Richmond Guano Co., Richmond, Va.	Premium Dissolved Bone	Monroe	D	8.85	3.57	12.42	----	----	----	----	9.94
2309	----do	----do	Wilkesboro	D	7.05	6.23	13.28	----	----	----	----	10.62
2136	Royster, F. S. Guano Co., Norfolk, Va.	Royster's Dissolved Bone	Burlington	D	8.00	5.58	13.58	----	----	----	----	10.86
1974	----do	----do	Lilesville	N	13.35	.02	13.37	----	----	----	----	10.70
2018	Va.-Carolina Chemical Co., Richmond, Va.	Allison & Addison's I X L Acid Phosphate.	Monroe	D	11.38	2.32	13.70	----	----	----	----	10.96
1834	----do	Almont Acid Phosphate	Magnolia	D	6.80	5.86	12.66	----	----	----	----	10.13
2021	----do	Charlotte Acid Phosphate	Belmont	R	10.92	2.37	13.29	----	----	----	----	10.63
2247	----do	Chatham 13 Per Cent Acid Phosphate.	Elkin	D	10.88	3.20	14.08	----	----	----	----	11.26
2170	----do	Clipper Brand Acid Phosphate	Charlotte	D	9.90	4.15	14.05	----	----	----	----	11.24
2145	----do	Crenshaw's Acid Phosphate	Granite Falls	D	9.25	3.84	13.09	----	----	----	----	10.47
1956	----do	Cotton Brand High Grade Acid Phosphate.	Wilson	D	9.50	3.27	12.77	----	----	----	----	10.22
1904	----do	Double Bone Phosphate—Extra Strong.	Lumberton	D	8.03	3.81	11.84	----	----	----	----	9.47

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ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1902—Continued.

Laboratory No.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100. Water-Soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-Soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Potash.	Relative Value Per Ton at Factory.
	RAW OR UNMIXED FERTILIZER MATERIALS.											
	Brands claiming						13.00					$10.40
2182	Va.-Carolina Chemical Co., Richmond, Va.	Durham High Grade Acid Phosphate.	Greensboro	D	9.60	3.65	13.25					10.60
2175	do	Norfolk Best Acid Phosphate	Clayton	N	9.13	4.38	13.51					10.81
2279	do	do	Asheville	R	9.08	4.54	13.62					10.90
1815	do	Norfolk Best Acid Phosphate	Faison	D	10.55	3 45	14.00					11.20
2014	do	Old Dominion High Grade Bone Phosphate.	Monroe	N	10.12	3.58	13.70					10.96
2027	do	do	Cherryville	D	11.08	2.71	13.79					11.03
1949	do	Owl Brand High Grade Acid Phosphate.	Salem	R	9.78	3.34	13.12					10.50
1824	do	Standard Dissolved S. C. Bone	Warsaw	D	9.25	3.87	13.12					10.50
2119	do	Tinsley's Dissolved S. C. Bone	Charlotte	D	10.88	2.33	13.21					10.57
2101	do	Victor High Grade Acid Phosphate.	Efland	R	8.72	2.66	11.38					9.10
	Brands claiming						14.00					11.20
2201	Acme Mfg. Co., Wilmington, N. C.	Acme Acid Phosphate	Greensboro	N	11 98	2.06	14.04					11.24
1962	American Agricultural Chemical Co., New York.	Lazaretto Dissolved Bone and Phosphate.	Edenton	D	13.80	2.06	15.86					12.69
1872	American Fert. Co., Norfolk, Va.	High Grade Acid Phosphate	New Bern	D	10.55	4.72	15.27					12.22
2308	do	do	Gaston	D	11.78	2.15	13.93					11.14
2140	Armour Fertilizer Works, Baltimore, Md.	Armour Star Phosphate	Wilmington	R	12.35	3.05	15.40					12.32
2290	do	do	Liberty	N	12.70	1.51	14.21					11.37
2206	Arps, Geo. L., Guano Co., Norfolk, Va.	14 Per Cent Acid Phosphate	Kelford	D	7.43	5.36	12.79					10.23
1871	Baugh & Sons Co., Norfolk, Va.	Baugh's High Grade Acid Phosphate.	New Bern	N	13.18	2.55	15.73					12.58
2001	do	do	Mentonsville	N	11.90	2.57	14.47					11.58
2000	do	do	Edenton	D	9.65	3.11	12.76					10.21
1790	do	do	Salisbury	R	7.85	5.61	13.46					10.77
2072	Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.	Climax Dissolved Bone	Albemarle	N	11.75	2.44	14.19					11.35

2299	Columbia Guano Co., Norfolk, Va.	Columbia High Grade Acid Phosphate.	Seaboard	D	8.25	5.53	13.78					11.02
2038	do	Columbia 14 Per Cent Acid Phosphate.	Wake Forest	R	10.88	2.75	13.63					10.90
2090	Cowell, Swann & McCotter Co., Bayboro, N. C.	Cowell, Swann & McCotter Co.'s Bone Phosphate.	Bayboro	D	10.52	3.78	14.30					11.44
1970	Lynchburg Guano Co., Lynchburg, Va.	Lynchburg H. G. Acid Phosphate.	Cameron	R	11.38	3.40	14.78					11.82
1897	Meadows, E. H. & J. A. Co., New Bern, N. C.	Diamond Acid Phosphate	Kinston	D	10.98	4.47	15.45					12.36
2147	Ober, G. & Sons Co., Baltimore, Md.	Ober's Dissolved Bone Phosphate.	Greensboro	D	14.00	2.18	16.18					12.94
2125	Patapsco Guano Co., Baltimore, Md.	Patapsco Dissolved S. C. Phosphate.	Godwin	D	10.82	4.23	15.05					12.04
2103	Pocahontas Guano Co., Lynchburg, Va.	Imperial Dissolved S. C. Phosphate.	Hillsboro	D	9.52	4.22	13.74					10.79
1814	Pocomoke Guano Co., Norfolk, Va	Peerless Acid Phosphate	Faison	D	11.53	3.89	15.42					12.34
1938	Rasin-Monumental Co., Baltimore, Md.	Rasin's Acid Phosphate	Lumberton	D	9.50	3.73	13.23					10.58
1973	Royster, F. S. Guano Co., Norfolk, Va.	Royster's High Grade 14 Per Cent Acid Phosphate.	Rockingham	D	9.13	4.66	13.79					11.03
2294	do	do	Farmville	D	7.75	6.31	14.06					11.25
2120	Swift Fert. Works, Atlanta, Ga	Swift's High Grade Cultivator.	Charlotte	D	8.08	6.39	14.47					11.58
2165	Va. Car. Chem. Co., Richmond, Va.	Allison & Addison's Fulton Acid Phosphate.	Statesville	D	11.63	2.76	14.39					11.51
1914	do	Excelsior Dissolved Bone	Belcross	N	10.53	3.45	13.98					11.18
2055	do	Red Cross Acid Phosphate	Concord	B	9.25	4.37	13.62					10.90
1950	do	Tinsley's Powhatan High Grade Phosphate.	Selma	N	10.60	3.06	13.66					10.93
2043	do	Traver's Dissolved Bone Phosphate.	Monroe	N	10.08	3.43	13.51					10.81
1915	do	V.-C. C. Co.'s Guaranteed 14 Per Cent Acid Phosphate.	Elizabeth City	N	9.75	4.00	13 75					11.00
2293	do	do	LaGrange	N	10.15	3.81	13.96					11.17
1916	do	Valley of Virginia Bone Phosphate.	Elizabeth City	D	10.20	3.56	13.76					11.01
2146	Virginia State Fert. Co., Lynchburg, Va.	Gilt Edge Acid Phosphate	Catawba	D	11.58	3.69	15.27					12.22
	Brand claiming						15.00					12.00
1998	Va.-Car. Chem. Co., Richmond, Va.	Charlotte 15 Per Cent Acid Phosphate.	Monroe	D	12.75	2.84	15.59					12.47
	Brands claiming						16.00					12.80
2257	Atlantic Chem. Co., Norfolk, Va.	Atlantic 16 Per Cent Acid Phosphate.	Goldston	D	11.92	4.96	16.88					13.50
2016	Powhatan Chem. Co., Richmond, Va.	Magic Dissolved Bone Phosphate.	Monroe	D	12.12	4.46	16.58					13.26
2318	do	do	Franklinton	D	11.75	4.77	16.52					13.22
2008	Royster, F. S. Guano Co., Norfolk, Va.	Royster's 16 Per Cent High Grade Acid Phosphate.	Monroe	D	10.40	5.22	15.62					12.50
2246	Va.-Car. Chem. Co., Richmond, Va.	Click's 16 Per Cent Acid Phosphate.	Elkin	R	10.52	5.46	15.98					12.78

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ANALYSES OF COMMERCIAL FERTILIZERS—SPRING SEASON, 1902—Continued.

Raw or Unmixed Fertilizer Materials

Laboratory No.	Name and Address of Manufacturer.	Name of Brand.	Where Sampled.	Mechanical Condition.	Percentage Composition or Parts per 100. Water-Soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Available Phosphoric Acid.	Water-Soluble Ammonia.	Organic Ammonia.	Total Ammonia.	Potash.	Relative Value Per Ton at Factory.
	Brands claiming						16.00					$12.80
2054	Va.-Car. Chem. Co., Richmond, Va.	Comet Acid Phosphate	Concord	R	10.88	4.71	15.59					12.47
2230	Virginia State Fert. Co., Lynchburg, Va.	Bull Run Acid Phosphate	Kernersville	D	15.00	3.36	18.36					14.69
	Brands claiming										12.00	12.00
2121	Acme Mfg. Co., Wilmington, N. C.	Pure German Kainit	Charlotte	S							12.78	12.78
1963	American Agricultural Chemical Co., New York, N. Y.	German Kainit	Edenton	S							12.58	12.58
2045	American Fert. Co., Norfolk, Va.	Genuine German Kaidit	Monroe	R							12.68	12 68
1987	Armour Fertilizer Co., Baltimore, Md.	Armour's German Kainit	Wadesboro	S							12 88	12.88
2056	Ashepoo Fertilizer Co., Charleston, S. C.	German Kainit	Charlotte	B							12.50	12.50
2208	Atlantic Chem. Co., Norfolk, Va.	Genuine German Kainit	Concord	R							12.14	12.14
1864	Best & Thompson, Goldsboro, N. C.	Pure German Kainit	Goldsboro	S							12.52	12.52
1835	Calder Bros., Wilmington, N. C.	Genuine German Kainit	Whiteville	S							12.58	12.58
2207	Columbia Guano Co., Norfolk, Va.	do	Kelford	R							12.20	12.20
2091	Cowell, Swan & McCotter Co., Bayboro, N. C.	Cowell, Swan & McCotter Co.'s Genuine Kainit.	Bayboro	R							12.58	12.58
1986	MacMurphy, W. C. Co., Charleston, S. C.	Pure German Kainit	Wadesboro	S							12.28	12.28
1873	Meadows, E. H. & J. A. Co., New Bern, N. C.	German Kainit	New Bern	B							14.40	14.40
2209	Ober & Sons Co., Norfolk, Va.	Kainit	Concord	S							12.76	12.76
2084	Richmond Guano Co., Richmond, Va.	Pure German Kainit	Huntersville	S							13.18	13.18
1976	do	do	Rockingham	S							12.64	12.64
1975	Royster, F. S. Guano Co., Norfolk, Va.	Genuine German Kainit	do	S							12.42	12.42
1905	Va.-Car. Chem. Co., Richmond, Va.	do	Whiteville	S							12.76	13.76
1863	Weil, H. & Bro., Goldsboro, N. C.	do	Goldsboro	S							13 04	13.04
	Brand claiming										45.00	45.00
2057	Ashepoo Fertilizer Co., Charleston, S. C.	Muriate of Potash	Charlotte	R							50.52	50.52

	Brand claiming										50.00	50.00
2255	Va.-Car. Chem. Co., Richmond, Va.	Muriate of Potash	Hendersonville	S							49.68	49.68
	Brand claiming										2.00	2.00
1898	Lee, A. S. & Son, Richmond, Va.	Lee's Prepared Agricultural Lime.	LaGrange	R							2.30	2.30
	Brand claiming									9.00		23.40
1838	Bell, Westbrook & Jurney, Beaufort, N. C.	Ground Fish	Mount Olive	B						9.96		25.90
	Brands claiming									10.00		26.00
1836	Baugh & Sons Co., Norfolk, Va.	Fine Ground Fish		R						10.02		26.05
1837	Dey & Bros., Beaufort, N. C.	Fish Scrap		R						9.52		24.75
	Brand claiming									19.00		49.40
2033	Baugh & Sons Co., Norfolk, Va.	Nitrate of Soda	Myrtle Hill	BP						19.04		49.50
	Brands claiming									7.50		19.50
1964	Cotton Oil and Fiber Co., Norfolk, Va.	Cofco Cotton-seed Meal	Edenton	D						8.01		20.83
2142	New Bern Cotton Oil and Fertilizer Mills, New Bern, N. C.	Cotton-seed Meal for Fertilizer	Pollocksville	D						7.89		20.51
1883	N. C. Cotton Oil Co., Wilmington, N. C.	do	Ahoskie	N						7.56		19.66
2039	N. C. Cotton Oil Co., Raleigh, N. C.	do	Wake Forest	D						7.68		19.97
1965	Southern Cotton Oil Co., Conetoe, N. C.	do	Edenton	R						8.16		21.22
2191	Southern Cotton Oil Co., Goldsboro, N. C.	do	Four Oaks	R						7.88		20.49
2232	Southern Cotton Oil Co., Rocky Mount, N. C.	do	Rocky Mount	D						7.81		20.31
1957	Southern Cotton Oil Co., Wilson, N. C.	do	Wilson	R						7.90		20.54
	Brands claiming									8.00		20.80
1988	Anson Oil and Ice Co., Wadesboro, N. C.	Cotton-seed meal								7.76		20.18
2034	N. C. Cotton Oil Co., Charlotte, N. C.	Cotton-seed Meal for Fertilizer	Red Springs	D						8.59		22.33
	Brand claiming								4.25			
2223	Baugh & Sons Co., Norfolk, Va.	Baugh's Bone Meal	High Point	D						4.56		*24.50

N, D, R, S, B, P, Y and W refer to the mechanical condition of fertilizers, as follows: N—fine; D—good; R—fair; S—coarse; B—very coarse; P—damp; Y—lumpy; W—wet.

*Total Phosphoric Acid found 21.08, valued in bone meal at three cents per pound.

II.

FERTILIZER BRANDS REGISTERED FOR 1902.

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash
American Agricultural Chemical Co., New York—			
Bakers' Dissolved Bone Phosphate	14.00		
Canton Chemical Game Guano	8.00	2.00	2.00
Clark's Orinoco Tobacco Fertilizer	8.00	3.00	4.00
Zell's Ammoniated Bone Superphosphate	8.00	2.00	1.00
Zell's Special Compound for Tobacco	8.00	2.00	2.00
Zell's Tobacco Fertilizer	8.00	3.00	4.00
British Mixture	8.00	2.50	2.50
Oriole High Grade Fertilizer	9.00	2.50	2.00
Reese's Pacific Guano for Tobacco	8.50	3.00	2.50
" Pacific Guano	8.00	2.00	2.00
" Dissolved Phosphate of Lime	14.00		
Lazaretto Dissolved Bone Phosphate	14.00		
" Dissolved Bone and Potash	10.00		2.00
" Crop Grower	8.00	2.00	2.00
Truckers' Favorite for Promoting Quick Growth, Manufactured for Wm. Bragaw & Co.	6.00	7.00	5.00
Gold Dust Guano, Mfd. for Holmes & Dawson	9.00	2.00	2.00
Triumph Soluble Guano, Mfd. for Holmes & Dawson	8.00	2.00	2.00
Lazaretto Special for Tobacco and Potatoes	8.00	3.00	3.00
Purity Guano, Mfd. for Savage, Son & Co	8.00	2.00	2.00
Crop Grower for Cotton, Corn and Root Crops; Mfd. for Wm. Bragaw & Co.	8.00	2.00	2.90
Pamlico Trucker; Mfd. for Wm. Bragaw & Co	7.00	5.00	8.00
Dissolved Bone Phosphate; Mfd. for Wm. Bragaw & Co	14.00		
Genuine German Kainit			12.00
Lazaretto 10 Per Cent Guano	5.00	10.00	3.00
Honeypod Special Trucker; Mfd. for W. P. Baugham	7.00	5.00	8.00
Honeypod Pride Fertilizer	8.00	4.00	5.00
Cottage Grove Special Truck Guano; Mfd. for W. P. Baugham	6.00	9.00	4.00
Early Trucker	7.00	5.00	5.00
Acid Phosphate	16.00		
American Fertilizer Co., Norfolk, Va.—			
American Eagle Guano	8.00	3.00	3.00
Special Formula for Yellow Leaf Tobacco Guano	9.00	3.50	5.00
Bob White Fertilizer for Tobacco	8.00	2.50	2.50
Peruvian Mixture for Tobacco	8.00	2.00	1.50
Bone and Peruvian Guano for Tobacco	8.00	2.00	2.00
Bone and Peruvian Guano	8.00	2.00	2.00
Peruvian Mixture	8.00	2.00	1.50
American Ammoniated Bone	8.00	2.00	1.00
High Grade Acid Phosphate	14.00		
Dissolved Bone and Potash for Corn and Wheat	10.00		2.00
Acid Phosphate	12.00		
Ten Per Cent Ammonia Guano	6.00	10.00	2.00
Standard 7 Per Cent Ammonia Guano	7.00	7.00	5.00
Strawberry Guano	9.00	3.50	9.00
Low Grade Special Formula	7.00	4.00	4.00
Sulphate of Potash			49.00
Tankage		7.00	
Muriate of Potash			50.00
Sulphate of Ammonia		25.00	
Genuine German Kainit			12.00
Pure Dissolved Bone	12.00	2.50	
Nitrate of Soda		19.00	
Fish Scrap		10.00	
Bone Meal	21.00	3.50	
Blood and Bone Compound	8.00	2.50	1.00
Pitt County Special Fertilizer for Yellow Leaf Tobacco	9.00	3.50	5.00
Special Potato Guano	7.00	5.00	7.00
Special Potato Manure	6.00	5.00	7.00
American Cotton Compound	8.00	2.00	2.00
Blalock's High Grade Guano	8.00	3.00	3.00
J. G. Miller & Co.'s Yellow Leaf Tobacco	9.00	3.00	3.00
A. L. Hannah's Special Formula Guano	8.00	2,00	2.00
American High Grade Acid Phosphate	16.00		
Eagle High Grade Acid Phosphate	13.00		
The Armour Fertilizer Works, Baltimore, Md.—			
Armour's General, 2-8-2	8.00	2.00	2.00
" German Kainit			12.00
" Star Phosphate	14.00		
" 13 Per Cent Acid Phosphate	13.00		

LIST OF FERTILIZERS REGISTERED—Continued.

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash
The Armour Fertilizer Works, Baltimore, Md.—			
Armour's Phosphate and Potash, No. 2	8.00		5.00
" Phosphate and Potash, No. 1	10.00		2.00
" Nitrate of Soda		18.00	
" 10 Per Cent Tankage		10.00	
" Blood and Bone	7.00	6.00	
" Blood, Bone and Potash	8.00	5.00	7.00
" 7 Per Cent Trucker	6.00	7.00	5.00
" 10 Per Cent Trucker	5.00	10.00	3.00
" All Soluble	8.00	3.50	4.00
" Manure Substitute	6.00	4.00	4.00
" Tobacco Special	8.00	3.00	3.00
" Champion Fertilizer	8.00	2.50	2.50
" Muriate of Potash			50.00
" King Cotton	8.00	2.50	1.00
" Blood		16.00	
" High Grade Manure for Light Soil	6.00	5.00	5.00
Sulphate of Potash			50.00
Armour's Acciduated Bone Meal	18.00	2.00	
" (7–30) Tankage	5.00	7.00	
" (8–20) Tankage	3.00	8.00	
" Raw Bone Meal total	20.00	4.50	
" Bone Meal	24.00	3.00	
Little Sam's Big Tobacco Grower	8.00	3.50	6.00
Cotton Special	8.00	3.00	3 00
Armour's Valley Brand Tobacco	8.00	2.00	5.00
Geo. L. Arps & Co., Norfolk, Va.—			
Geo. L. Arps & Co. Premium Tobacco Guano	8.00	2.50	2.00
High Grade Premium Guano for Cotton, Tobacco and all spring crops.	8.00	2.00	2.00
Geo. L. Arps' 14 Per Cent Acid Phosphate	14.00		
Genuine German Kainit			12.00
Ashepoo Fertilizer Co., Charleston, S. C.—			
Ashepoo Golden Tobacco Producer	8.00	3.00	3.00
" High Grade Ammoniated Superphosphate	8.00	3.00	2.00
" Harrow Brand Raw Bone Superphosphate	9.00	2.00	2.00
" Wheat and Oat Specific	9.00	2.00	1.00
" High Grade Acid Phosphate and Potash	12.00		1.00
" Potash Acid Phosphate	11.00		1.00
" Super Potash Acid Phosphate	10.00		4.00
" High Grade Acid Phosphate	13.00		
" Dissolved Bone	12.00		
" Acid Phosphate	12.00		
" Fruit Grower	8.00	4.75	2.75
" XX Guano	8.50	2.00	2.00
" XX Acid Phosphate	12.00		
" XXX Acid Phosphate	13.00		
" Guano	8.00	2.50	1.00
" Fertilizer	9.00	2.25	1.00
" Circle Guano	8.00	2.50	2.00
Eutaw Acid Phosphate	12.00		
" High Grade Acid Phosphate	13.00		
" Potash Acid Phosphate	11.00		1.00
" High Grade Acid Phosphate and Potash	12.00		1.00
" O Guano	8.00	2.50	2.00
" XX Guano	8.50	2.00	2.00
" XX Acid Phosphate	12.00		
" Fertilizer	9.00	2.25	1.00
Coomassic Acid Phosphate	12.00		
Circle Bone	13.00		
Palmetto Potash Acid Phosphate	11.00		1.00
Enoree Acid Phosphate	10.00		2.00
P. D. Fertilizer	8.00	2.00	1.00
Carolina Acid Phosphate	13.00		
Carolina Guano	8.00	2.00	2.00
Carolina XXX Guano	8.00	3.00	3.00
Nitrate of Soda		18.00	
Muriate of Potash			45.00
Sulphate of Ammonia		22.00	
German Kainit			12.00
Anson Oil and Ice Co., Wadesboro, N. C.—			
Cotton Seed Meal		8.00	
Acme Manufacturing Co., Wilmington, N. C.—			
Acme Acid Phosphate	13.00		

LIST OF FERTILIZERS REGISTERED—Continued.

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash
Acme Manufacturing Co., Wilmington, N. C.—			
Acme Cotton Fertilizer	8.50	2.00	2.00
" Special Grain Fertilizer	8.50	2.00	2.00
" Bone and Potash	8.00		4.00
" " " "	12.00		1.00
" Acid Phosphate	11.00		2.00
" " "	11.00		1.00
" " "	10.00		4.00
" " "	10.00		3.00
" " "	10.00		2.00
" " "	10.00		1.00
" " "	12.00		
" " "	14.00		
" Soluble Bone	8.00	2.50	1.00
" Fertilizer	8.00	3.00	2.50
" Fertilizer for Tobacco	8.00	3.00	2.50
" Ammoniated Dissolved Bone	8 00	2.50	1.00
Gem Fertilizer	8.50	2.00	2.00
Lattimore's Complete Fertilizer	8.00	2.50	2.00
Tip-Top Tobacco Grower	8 00	2.50	3.00
Pure German Kainit			12.00
Acme Standard Guano	8.00	2.50	2.00
Atlantic Chemical Co., Norfolk, Va.—			
Atlantic Tobacco Grower	8.00	2.50	3.00
" Tobacco Compound	8.00	2.50	2.00
" Soluble Guano	8.00	2.00	2.00
" Cotton Grower	8.00	2.50	1.00
" Special Guano	8.00	2.00	1.00
" Bone and Potash	10.00		2.00
" Bone and otash	8.00		2.00
" Acid Phosphate	12.00		
" Dissolved Bone	13.00		
" H. G. 14 Per Cent Acid Phosphate	14.00		
" H. G. 16 Per Cent Acid Phosphate	16.00		
Muriate of Potash			50.00
Sulphate of Potash			50.00
Nitrate of Soda		19.00	
Genuine German Kainit			12.00
McCaskill's High Grade Guano	10.00	5.00	8.00
" Special Guano	8.00	3.00	4.00
Baugh & Sons Co., Norfolk, Va.—			
Baugh's Double Eagle Phosphate	8.00	2.00	1.00
" Soluble Alkaline Superphosphate	10.00		2.00
" New Process 10 Per Cent Guano	5.00	10.00	2.50
" Sulphate of Ammonia		25.00	
Grand Rapid Guano	8.00	3.00	3.00
Baugh's Fish Mixture	8.00	2.00	2.00
" Animal Bone and Potash Compound for all crops	8.00	2.00	2.00
" Special Cotton Guano	8.00	2.00	
" Peruvian Guano Substitute	6.00	5.00	7.00
" Cabbage Guano	6.00	7.00	5.00
" 7 Per Cent Potato Guano	6.00	7.00	5.00
The Old Stand By, Baugh's Raw Bone Superphosphate and Ammoniated Dissolved Animal Bone.	8.00	2.00	1.00
Fine Ground Fish		10.00	
Genuine German Kainit			12.00
Baugh's High Grade Tobacco Guano	8.00	3.00	3.00
" High Grade Acid Phosphate	14.00		
Sulphate of otash			50.00
Nitrate of Soda		19.00	
Baugh's Dissolved Animal Bone, warranted pure	13.00	2.50	
" Bone Meal, warranted pure total	21.50	4.00	
Muriate of Potash			50.00
Dried Blood		16.00	
J. L. Bailey & Co., Elm City, N. C.—			
Fairmont Guano	8.00	3.00	3.00
Stag Brand Fertilizer	8.00	2.00	2.00
James Ronday, Jr. & Co., Baltimore, Md.—			
Nitrate of Soda		18.00	
Old Reliable Brand, Genuine German Kainit			12.00
No. 1 Syndikat Sulphate of Potash			48.00
No. 1 Syndikat Muriate of Potash			50.00
Best & Thompson, Goldsboro, N. C.—			
Pure German Kainit			12.00

LIST OF FERTILIZERS REGISTERED—Continued.

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash
Bradley Fertilizer Co., Charleston and Boston.—			
B. D. Sea Fowl Guano	9.00	2.25	1.00
Eagle Ammoniated Bone Superphosphate	8.00	2.25	1.00
Bradley's Patent Superphosphate	9.00	2.25	1.00
" Palmetto Acid Phosphate	12.00	----	----
" Acid Phosphate	12.00	----	----
" German Kainit	----	----	12.00
" Ammoniated Dissolved Bone	8.00	2.25	1.00
Wm. Bragaw & Co., Washington, N. C.—			
Tuckahoe Tobacco	8.00	2.50	3.00
Havana Tobacco Guano	8.00	3.00	3.00
Tar Heel Special Guano	8.00	2.00	2.00
Old Reliable Premium	8.00	2.00	2.00
Beaufort County Guano	8.00	3.00	3.00
Chocowinity Special Tobacco Fertilizer	5.00	4.00	6.00
Genuine German Kainit	----	----	12.00
Blackstone Guano Co., Blackstone, Va.—			
Bone and Potash	10.00	----	2.00
Alliance	8.00	2.00	2.00
Alliance for Tobacco	8.00	2.00	2.00
Bellefonte	8.00	4.00	2.00
Hard Cash	8.00	2.50	2.00
Blackstone Standard	8.00	2.00	2.00
Bell, Westbrook & Journey, Beaufort, N. C.—			
Ground Fish Scrap	----	9.00	----
J. A. Benton, Ruffin, N. C.—			
North Carolina Bright Tobacco Fertilizer	9.00	2.00	2.00
Caraleigh Phosphate and Fertilizer Works, Raleigh, N. C.—			
Muriate of Potash	----	----	50.00
Climax Dissolved Bone	14.00	----	----
Staple Acid Phosphate	12.00	----	----
Sterling High Grade Acid Phosphate	13.00	----	----
Electric Bone and Potash Mixture	10.00	----	2.00
Sulphate of Potash	----	----	50.00
Genuine German Kainit	----	----	12.00
Eclipse Ammoniated Guano	8.00	2.50	2.00
Caraleigh Special Tobacco Guano	8.00	2.50	3.00
Eli Ammoniated Fertilizer	8.00	2.00	2.00
Pacific Tobacco and Cotton Grower	9.00	2.75	2.00
Comet Guano	8.00	2.00	1.00
Crown Ammoniated Guano	8.00	2.00	1.50
Planters' Pride	8.00	2.50	3.00
Nitrate of Soda	----	19.00	----
Horne & Sons High Grade Bone and Potash	11.00	----	5.00
Cumberland Bone Phosphate Co., Charleston and Portland, Me.—			
Cumberland Bone Phosphate of Lime	8.00	2.25	1.00
Columbia Guano Co., Norfolk, Va.—			
Hyco Tobacco Guano	8.00	3.00	3.00
Columbia H. G. Special Tobacco Guano	8.00	2.50	2.00
Rex Brand Ammoniated Guano	8.00	2.50	1.00
Columbia Soluble Guano	8.00	2.00	2.00
Columbia Bone and Potash	8.00		2.00
" " " "	10.00	----	2.00
Columbia Acid Phosphate	12.00	----	----
Dissolved Bone	13.00	----	----
Columbia High Grade 14 Per Cent Acid Phosphate	14.00	----	----
Columbia High Grade 16 Per Cent Acid Phosphate	16.00	----	----
Columbia Potato Guano	7.00	5.00	7.00
Carolina Soluble Guano	8.00	2.00	1.00
Sulphate of Potash	----	----	50.00
Muriate of Potash	----	----	50.00
Nitrate of Soda	----	19.00	----
German Kainit	----	----	12.00
H. & D. Acid Phosphate	12.00	----	----
" H. G. Dissolved Bone	13.00	----	----
" Ammoniated Guano	8.00	2.00	2.00
" Special Ammoniated Guano	9.00	3.00	2.25
Combahee Fertilizer Co., Charleston, S. C.—			
Melon Fertilizer	10.00	3.00	7.00
Calder Bros., Wilmington, N. C.—			
Genuine German Kainit	----	----	12.00
Muriate of Potash	----	----	50.00
Nitrate of Soda	----	19.00	----

LIST OF FERTILIZERS REGISTERED—Continued.

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash
W. H. Camp, Petersburg, Va.—			
Camp's Prepared Chemicals, No. 1	8.00	3.50	7.50
Camp's Prepared Chemicals, No. 3	8.00	2.75	1.00
Chesterfield County Oil Co., Cheraw, S. C.—			
Cotton-Seed Meal	--------	8.00	--------
Cowell, Swan & McCotter Co., Bayboro, N. C.—			
Cowell, Swan & McCotter Co.'s Rust Proof Cotton Guano	8.00	2.00	3.00
" Bone Phosphate	14.00	--------	--------
" Crop Guano	8.00	2.00	2.00
" Potato Guano	8.00	2.50	3.00
" German Kainit	--------	--------	12.00
" H. G. Truck Guano	7.00	5.00	5.00
" Quick Grower	8.00	2.50	3.00
" Potato Favorite Guano	7.00	4.00	7.00
" Cabbage Guano	5.00	10.00	2.50
" Standard Cotton Grower	10.00	4.00	3.00
" Fish and Bone Guano	8.00	2.00	2.00
Cotton Oil and Fibre Co., Norfolk, Va.—			
Cotton-Seed Meal	--------	7.50	--------
Dey & Bro , Beaufort, N. C.—			
Ground Fish Scrap	--------	10.00	--------
Etiwan Fertilizer Co., Charleston, S. C.—			
Etiwan Special Potash Mixture	8.00	--------	4.00
" Vegetable Fertilizer	8.00	4.00	5.00
" Soluble Bone with Potash	10.00	--------	3.00
" Potash Bone	10.00	--------	4.00
" Dissolved Bone	13 00	--------	--------
" Ammoniated Dissolved Bone	9.00	2.00	2.00
" Acid Phosphate with Potash	11.00	--------	1.00
" Guano	8.00	2.50	1.00
Diamond Soluble Bone with Potash	10.00	--------	2.00
Diamond Soluble Bone	13.00	--------	--------
Plow Brand Acid Phosphate with Potash	11.00	--------	1.00
" " Ammoniated Dissolved Bone	9.00	2.00	2.00
" " Raw Bone Superphosphate	8.00	2.50	1.00
" " Special Tobacco Fertilizer	8.00	4.00	4.00
XX Acid Phosphate with Potash	10.00	--------	2.00
Genuine German Kainit	--------	--------	12.00
Farmers Guano Co., Raleigh, N. C.—			
Farmers H. G. Acid Phosphate	13.00	--------	--------
Toco-Tobacco Guano	8.00	2.50	3.00
Golden Grade Guano	8.00	3.00	3.00
Century Bone and Potash Mixture	10.00	--------	2.00
State Standard Guano	8.00	2.00	2.00
Crumpler's Standard Premium	8.00	2.00	2.00
Green & Yarboro, Louisburg, N. C.—			
Green & Yarboro, H. G. Fertilizer	8.00	2.50	2.00
The Home Fertilizer Chemical Works, Baltimore, Md.—			
High Grade Acid Phosphate	14.00	--------	--------
Boykin's Dissolved Animal Bone	12.00	2.00	--------
Cerealite Top Dressing	--------	9.00	2.50
Boykin's Cereal Fertilizer	8.00	2.00	2.00
Everybody's Fertilizer	9.00	--------	2.00
Yancey's Formula for Yellow Leaf Tobacco	8.00	3.00	2.00
Home Fertilizer Chemicals	--------	7.00	7.00
Boykin's Alkaline Bone	10.00	--------	2.00
Home Potato Grower	6.00	4.00	4.00
Phœnix Crop Grower	8.00	3.00	2.00
Kainit	--------	--------	12.00
Sulphate of Potash	--------	--------	50.00
Muriate of Potash	--------	--------	50.00
Nitrate of Soda	--------	19.00	--------
Home Potato Grower	6.00	4.00	4.00
J. C. Hadley & Co., Wilson, N. C.—			
John Hadley's Special High Grade Plant Food	8.00	2.00	2.00
Hadley's Boss Guano	8.00	2.75	2.50
S. B. Harrell & Co., Norfolk, Va.—			
Harrell's Champion Cotton and Peanut Grower	8.00	2.00	2.00
" Acid Phosphate	14.00	--------	--------
" Truck Guano	6.00	7.00	5.00
Haven's Oil Co., Washington, N. C.—			
Cotton-Seed Meal	--------	7.50	--------
" " "	--------	8.00	--------

LIST OF FERTILIZERS REGISTERED—Continued.

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash
M. P. Hubbard & Co., Baltimore, Md.—			
Bermuda Guano for Early Truck, etc	7.00	7.00	4.00
Blood		15.00	
Hubbard's Soluble S. C. Phosphate	14.00		
Muriate of Potash			50.00
Nitrate of Soda		19.00	
Sulphate of Potash			48.00
Ground Fish	7.75	9.50	
Hubbard's Farmers' Acme, prepared especially for Corn, Tomatoes, Potatoes, Peanuts, Cotton, etc.	7.00	2.00	2.00
The Imperial Co., Norfolk, Va.—			
Imperial 10 Per Cent Guano	6.00	10.00	2.00
" Tobacco Guano	8.00	3.00	3.00
" Peanut and Corn Guano	8.00	2.00	2.00
Standard Premium Guano	8.00	2.00	1.50
Imperial 7 Per Cent for Potatoes	5.00	7.00	5.00
" Champion Guano	8.00	2.00	2.00
" Cotton Grower	8.00	2.00	1.50
" Fish and Bone	6.00	4.00	4.00
" Bright Chief Tobacco	8.00	2.00	2.00
" Pitt County Special Tobacco	4.00	4.00	6.00
" Cisco Soluble Guano	8.00	2.00	2.00
" H. G. Acid Phosphate	14.00		
" H. G. Tenn. Acid Phosphate	16.00		
" Bone and Potash	8.00		2.00
" Special 10 Per Cent Guano	5.00	10.00	2.50
" Ammoniated Guano	8.00	3.00	3.00
German Kainit			12.00
Muriate of Potash			50.00
Nitrate of Soda		19.00	
Tucker's Special Tobacco Guano; Mfd. for G. M. Tucker	8.00	3.00	3.00
" Favorite Tobacco Guano	8.00	2.50	3.00
" Delight for all Crops	8.00	2.00	2.00
Williams' Special Potato Guano	6.00	5.00	5.00
Imperial Guano for Bright Tobacco	8.00	2.50	3.00
" Special 7 Per Cent Guano for Potatoes and early truck	5.00	7.00	5.00
" Complete Tobacco Fertilizer	4 00	3.00	5.00
" 5-7-8 Truck Guano	7.00	5.00	8.00
Hyman's Choice Guano	4.00	4.00	6.00
H. H. Proctor's Special Guano	3.00	8.00	3.00
Folk's Peanut and Corn Guano, Mfd. for E. L. Folk & Co	8.00	2.00	3.00
Jamestown Bone Meal Co., Jamestown, N. C.—			
Bone Meal total	21.00	3.50	
Lynchburg Guano Co.—			
Solid Gold Tobacco Guano	8.50	2.75	4.00
Independent Standard	8.50	2.00	2.00
Lynchburg Soluble for Tobacco	8.00	2.00	2.00
" Soluble	8.00	2.00	2.00
New Era	8.00	2.00	1.00
Lynchburg Dissolved Bone and Potash	10.00		2.00
Ironside Acid Phosphate	16.00		
Lynchburg High Grade Acid Phosphate	14.00		
Sparrow Acid Phosphate	12.00		
Otter Brand Acid Phosphate	10.00		
Arvonia Acid Phosphate	13.00		
Genuine German Kainit			12.00
Parker & Harris' Special Tobacco Compound	9.00	2.50	1.50
High Grade Sulphate Potash			47.00
Nitrate of Soda		18.00	
A. S. Lee & Son, Richmond, Va.—			
Lee's Prepared Agricultural Lime			2.00
" " Excelsior Tobacco Fertilizer	8.00		2.00
Bone and Potash	9.00		4.00
Lister's Agricultural Chemical Works, Newark, N. J.—			
Lister's Special 7 Per Cent Potato Guano	6.00	7.00	5.00
" Potato Manure	8.00	4.00	7.00
" H. G. 10 Per Cent Potato Guano	4.00	10.00	
" 7 Per Cent Potato Guano	5.00	7.00	5.00
" Success	8.00	2.00	2.00
" A. D. Bone	8.00	2.50	1.50
Ammoniated Dissolved Bone Phosphate	8.00	2.50	2.00
A. H. Lindsay, Portsmouth, Va.—			
Cumberland Guano	8.00	4.00	4.00

LIST OF FERTILIZERS REGISTERED—Continued.

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash
The Mapes Formula and Peruvian Guano Co., New York.—			
The Mapes Fruit and Vine Manure	5.00	2.00	11.00
" Soluble Potato Manure	2.00	7.00	5.00
" Vegetable Manure	6.00	6.00	6.00
" Complete Manure A Brand	10.00	3.00	2.50
" Economical Potato Manure	4.00	4.00	8.00
" Potato Manure	8.00	4.50	6.00
" 10 Per Cent Truck Special	2.00	10.00	4.00
E. H. & J. A. Meadows Co., New Bern.—			
Meadows Great Cabbage Guano	7.00	7.00	7.00
Genuine Kainit			12.00
Diamond Acid Phosphate	14.00		
Meadows 10 Per Cent Guano	6.00	10.00	2.50
" Cotton Guano	8.00	2.00	2.00
" Gold Leaf Guano	8.00	3.00	3.00
" Seabird Guano	9.00	4.00	2.50
" Great Potato Guano	7.00	5.00	8.00
" Dissolved Bone and Potash Compound	10.00		2.00
" Laboss Guano	8.00	5.00	5.00
" All Crop Guano	8.00	2.50	2.50
Miller Fertilizer Co., Baltimore, Md.—			
High Grade Potato	6.00	5.50	7.00
Potato and Vegetable Grower	8.00	2.00	4.00
Truckers Profit	8.00	4.00	4.00
Standard Phosphate	8.00	3.00	3.00
The W. C. McMurphy Co., Charleston, S. C.—			
Excellent Cotton and Corn Guano	8.00	2.00	2.00
High Grade Acid Phosphate	13.00		
Special 8-3-3 Tobacco Guano	8.00	3.00	3.00
Truckers Special Potato Guano	7.00	4.00	5.00
Wilcox, Gibbs & Co, Manipulated Guano	9.00	2.75	2.00
Special 8-2-2 Cotton and Corn Guano	8.00	2.00	2.00
Truckers Special 6-5-6 Vegetable Guano	6.00	5.00	6.00
Truck Farmers Special Guano	10.00	4.00	4.00
Acid Phosphate and Potash	10.00		2.00
Double Ammoniated Truck Farmers Special Guano	8.00	8.00	4.00
Pure German Kainit			12.00
Sulphate of Potash			48.00
Muriate of Potash			48.00
Nitrate of Soda		19.00	
Hardison's 8-3-2 Cotton and Corn Guano	8.00	3.00	2.00
Special 9-3-3 Guano	9.00	3.00	3.00
Sulphate of Ammonia		25.00	
Special 7-5-5 Guano	7.00	5.00	5.00
R. J. Madry, Scotland Neck, N. C.—			
Madry's Special Tobacco Fertilizer	8.00	3.00	3.00
" Acid Phosphate	14.00		
Pure German Kainit			12.00
Navassa Guano Co., Wilmington, N. C.—			
Navassa Fruit Growers Fertilizer	8.00	2.00	6.00
" Dissolved Bone and Potash	10.00		2.00
" Grain Fertilizer	8.00	2.00	2.00
" Cotton Fertilizer	8.00	2.00	2.00
" Bone and Potash	8.00		2.00
" Wheat and Grass Grower	10.00		4.00
" High Grade Dissolved Bone	13.00		
" Acid Phosphate of Potash	10.00		1.00
" Gray Land Mixture	12.00		4.00
" Wheat Mixture	10.00		2.25
" Root Crop Fertilizer	7.00	5.00	7.00
" Special Wheat Mixture	12.00		4.00
" Acid Phosphate	12.00		
" Guano for Tobacco	8.00	2.50	2.00
" Special Truck Guano	8.00	4.00	4.00
" Complete Fertilizer	8.00	2.00	1.00
" Harvest King Soluble Guano	8.00	2.00	3.00
" Strawberry Top Dressing	8.00	2.50	4.00
" Universal Fertilizer	8.00	2.50	1.00
Clarendon Tobacco Guano	8.00	3.00	3.00
Coree Tobacco Guano	8.00	4.00	4.00
Harvey's Bone and Potash	8.00		3.00
Oconeechee Tobacco Guano	8.00	2.00	2.00
Croatan Acid Phosphate	10.00		
Warlick's Mixture	8.00		2.25
Genuine German Kainit			12.00
Ammoniated Soluble Navassa Guano	8.00	2.50	2.00

LIST OF FERTILIZERS REGISTERED—Continued.

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Po[illegible]
Navassa Guano Co., Wilmington, N. C.—			
Navassa Cotton-seed Meal Guano	8.00	2.00	2.00
" " Special 3 Per Cent Guano	8.00	3.00	2.00
New Bern Cotton Oil and Fertilizer Mills, New Bern, N. C.—			
Cotton-seed Meal	------	7.50	------
N. C. Cotton Oil Co., Raleigh, N. C.—			
Cotton-seed Meal	------	7.50	------
Raleigh Standard Guano	8.00	2.75	2.00
N. C. Cotton Oil Co., Wilmington, N. C.—			
Cotton-seed Meal	------	7.50	------
N. C. Cotton Oil Co., Charlotte, N. C.—			
Cotton-seed Meal	------	8.00	------
G. A. Norwood, Jr., Goldsboro, N. C.—			
Pure German Kainit	------	------	12.00
G. Ober & Sons Co., Baltimore, Md.—			
Ober's Special Compound for Tobacco	8.00	3.00	3.00
" Standard Tobacco Fertilizer	8.00	2.00	2.00
" Special Ammoniated Dissolved Bone	9.00	2.00	2.00
" Farmers Standard Ammoniated Phosphate	8.00	2.00	2.00
" Dissolved Bone Phosphate and Potash	10.00	------	2.00
" Dissolved Bone Phosphate	14.00	------	------
" Special Cotton Compound	8.00	2.00	2.00
Nitrate of Soda	------	18.00	------
Muriate of Potash	------	------	50.00
Kainit	------	------	12.00
Ober's Special High Grade Fertilizer	9.00	3.00	3.00
Patapsco Guano Co., Baltimore, Md.—			
Patapsco Dissolved S. C. Phosphate	14.00	------	------
Genuine German Kainit	------	------	12.00
Patapsco Special Tobacco Mixture	8.00	2.50	3.00
" Guano for Tobacco	9.25	2.50	2.00
" Soluble Bone and Potash	10.00	------	2.00
" High Grade Bone and Potash	11.00	------	5.00
" Tobacco Fertilizer	9.00	3.00	3.00
" Guano	9.25	2.50	2.00
Baltimore Soluble Phosphate	11.00	------	2.00
Sea Gull Ammoniated Guano	8.00	2.00	2.00
Unicorn Guano	8.00	2.50	3.00
Choctaw Guano	8.00	3.00	3.00
Patapsco Trucker for Early Vegetables	7.00	5.00	5.00
Planters Favorite	8.00	2.00	2.00
Pacific Guano Co., Charleston and Boston, Mass.—			
Soluble Pacific Guano	8.50	2.00	2.00
Pacific Acid Phosphate	12.00	------	------
Powhatan Chemical Co., Richmond, Va.—			
P. C. Co.'s Hustler	8.00	3.00	3.00
White Leaf Tobacco Fertilizer	8.00	2.50	3.00
Magic Tobacco Grower	8.00	2.00	2.00
" Cotton Grower	8.00	2.00	2.00
" Special Fertilizer	8.00	2.00	2.00
" Brand Ammoniated Phosphate	8.00	2.00	1.00
" Bone and Potash Mixture	10.00	------	4.00
" Dissolved Bone Phosphate	16.00	------	------
" S. C. Phosphate	10.00	------	------
Powhatan Acid Phosphate	13.00	------	------
High Grade Acid Phosphate	14.00	------	------
Virginia Dissolved Bone	12.00	------	------
Bone and Potash Mixture	10.00	------	2.00
Pure German Kainit	------	------	12.00
" Raw Bone Meal total	20.00	4.00	------
King Brand Guano	8.00	2.50	3.00
Groome's High Grade Tobacco Fertilizer	9.00	3.00	6.00
Pocahontas Guano Co., Lynchburg, Va.—			
High Grade 4 Per Cent Guano	9.00	2.25	4.00
Pocahontas Special Tobacco Fertilizer	9.00	3.00	3.00
Standard Tobacco Guano	9.00	2.00	2.00
Spot Cash Tobacco Compound	8.00	2.50	3.00
Yellow Tobacco Special	9.00	2.00	2.00
Carrington Banner Brand Guano	8.00	2.00	2.00
" Superior Grain Compound	10.00	------	2.00
Grain Special Bone and Potash, New Rival Brand	10.00	------	1.65
Imperial Dissolved S. C. Phosphate	14.00	------	------

LIST OF FERTILIZERS REGISTERED—Continued.

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash
The Pocomoke Guano Co., Norfolk, Va.—			
Crescent Complete Compound	8.00	2.00	3.00
Electric Crop Grower	8.50	2.00	2.00
Alkali Bone	11.00		2.00
Peerless Acid Phosphate	14.00		
Hampton Acid Phosphate	13.00		
Standard Truck Guano	7.00	5.00	5.00
Freeman's Irish Potato Grower	6.00	7.00	5.00
Pamlico Superphosphate	8.00	2.00	2.00
Pocomoke Superphosphate	8.50	2.00	2.00
Monarch Tobacco Grower	8.00	3.00	3.00
Cinco Tobacco Guano	8.50	2.50	2.50
Harvey's High Grade Monarch	8.00	3.00	3.00
Seaboard Popular Trucker	6.00	7.00	5.00
Monticello Animal Bone Fertilizer	9.00	2.25	4.00
Genuine German Kainit			12.00
Coast Line Truck Guano	5.00	10.00	3.00
Hornthal Tobacco Guano	8.00	2.00	3.00
L. P. H. Premium	8.00	2.00	2.00
Piedmont-Mt. Airy Guano Co., Baltimore, Md.—			
10 per cent Piedmont Guano for Truck	5.00	10.00	3.00
Piedmont H. G. S. C. Bone	14.00		
" Dissolved Bone Phosphate Potash Goods	10.50		1.00
" Soluble Bone and Potash	8.00		2.00
" Farmers H. G. Bone and Potash	10.00		2.00
" Potato Producer	5.00	3.00	6.00
" Guano for Cotton	8.00	2.00	1.00
" Guano for Tobacco	8.00	2.50	3.00
" Special for Cotton, Corn and Peanuts	8.00	2.00	2.00
" Essential Tobacco Compound	9.00	2.00	2.00
Mt. Airy Garden and Truck Fertilizer	8.00	4.00	3.00
Levering's Reliable Tobacco Guano	8.00	3.00	3.00
Piedmont Red Leaf Tobacco Guano	8.00	2.00	2.00
North Carolina Standard Phosphate	13.00		
Piedmont H. G. Truck Fertilizer	6.00	4.00	6.00
Muriate of Potash			50.00
Kainit			12.00
Parker & Hunt, Oxford, N. C.—			
Parker & Hunt's Special Tobacco Fertilizer	9.00	2.50	1.50
Quinnipiac Co., Charleston, S. C., New York and Boston.—			
Quinnipiac Pine Island Ammoniated Superphosphate	9.00	2.25	1.00
" Acid Phosphate	13.00		
Richmond Guano Co.—			
Special High Grade for Truck	7.00	6.00	5.00
Gilt Edge Fertilizer	8.00	3 00	3.00
Tip-Top Fertilizer	8.00	2.50	3.00
Special Premium Brand for Tobacco	8.00	2.25	2.25
Premium Tobacco Fertilizer	8.00	2.00	2.00
" Brand Fertilizer	8.00	2.00	2.00
Bone Mixture	8.00	2.00	1.00
Premium Bone and Potash Mixture	13.00		3.00
Rex Bone and Potash Mixture	10.00		4.00
Bone and Potash Mixture	10.00		2.00
Alkaline Bone	10.00		2.00
Rex Dissolved Bone Phosphate	16.00		
High Grade Acid Phosphate	14.00		
Premium Dissolved Bone	13.00		
Dissolved S. C. Phosphate	12.00		
Pure German Kainit			12.00
Old Homestead Dissolved Bone	10.00		
Pure Raw Bone Meal ... total	20.00	4.00	
Carolina Bright Specific Tobacco Fertilizer	8.50	2.75	2.25
Hunter & Dunn's Special Ammoniated Guano	9.00	3.00	2.25
" " Ammoniated Fertilizer	8.00	2.00	2.00
" " Dissolved Bone	13.00		
Burton's Special High Grade Fertilizer	9.00	3.00	3.00
Raisin-Monumental Co., Baltimore, Md.—			
Rasin Empire Guano	8.00	2.00	2.00
" Dixie Guano	8 00	2.00	1.00
" Acid Phosphate	14.00		
F. S. Royster Guano Co., Norfolk, Va., and Tarboro, N. C.—			
Orinoco Tobacco Guano	8.00	2.50	3.00
Tobacco Compound	8.00	2.50	2.00
Farmers Bone Fertilizer	8.00	2.00	2.00
Arrow Brand Guano	8.00	2.50	1.00

LIST OF FERTILIZERS REGISTERED—Continued.

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash
F. S. Royster Guano Co., Norfolk, Va., and Tarboro, N. C.—			
Special Compound	8.00	2.00	1.00
Truckers Delight	8.00	4.00	4.00
Royal Potato Guano	7.00	5.00	7.00
Ballentine's Potato Guano	6.00	7.00	7.00
Caledonia Compound	8.00	2.00	1.00
Harvey's Potash Mixture	8.00	--------	3.00
Carolina Bone and Potash	8.00	--------	2.00
Royster's Bone and Potash	10.00	--------	2.00
" Bone and Potash	8 00	--------	2.00
" Dissolved Bone	13.00	--------	2.00
" H. G. 14 Per Cent Acid Phosphate	14.00	--------	--------
" H. G. 16 Per Cent Acid Phosphate	16.00	--------	--------
XX Acid Phosphate	12.00	--------	--------
Sulphate of Potash	--------	--------	50.00
Muriate of Potash	--------	--------	50.00
Nitrate of Soda	--------	19.00	--------
Genuine German Kainit	--------	--------	12.00
John Hadley's Special Guano	8 00	2.00	2.00
Cooper's Pungo Guano	8.00	2.50	2.00
Reidsville Fertilizer Co., Reidsville, N. C.—			
Broad Leaf Tobacco Guano	8.00	2.25	2.50
Bone and Potash	8.00	--------	4.00
Royal Fertilizer	8.00	2.75	2.75
Banner Fertilizer	8.00	2.00	1.00
Lion Brand Fertilizer	9.00	3.00	6.00
Champion Fertilizer	8.00	2.00	2.00
Rowland Oil and Fertilizer Co., Rowland, N. C.—			
Cotton-seed Meal	--------	8.00	--------
Swift Fertilizer Works, Atlanta, Ga.—			
Swift's Special H. G. Guano	9.25	5.00	3.00
Pioneer H. G. Tobacco Grower	8.00	2.00	4.00
Cotton King H. G. Guano	9.00	3 00	2.00
Swift's Eagle H. G. Guano	10.00	2.00	2.00
" Golden Harvest Standard Grade Guano	8.00	2 00	2.00
" Monarch H. G. Guano	8.00	4.00	4.00
" Cotton Plant Standard Grade Guano	9 00	2.00	1.00
" Homestead H. G. Phosphate and Potash	10.00	--------	4.00
" Plantation Standard Grade Phosphate and Potash	8.00	--------	4.00
" Wheat Grower Standard Grade Phosphate and Potash	10.00	--------	2.00
" Field and Farm Standard Grade Phosphate and Potash	10.00	--------	2.00
" Red Steer Standard Grade Guano	8.00	2.00	2.00
" Chattahoochee Standard Grade Acid Phosphate	12.00	--------	--------
" Atlanta H. G. Acid Phosphate Compounded with Potash	12.00	--------	4.00
" Cultivator H. G. Acid Phosphate	14.00	--------	--------
" Muriate of Potash	--------	--------	50.00
" German Kainit	--------	--------	12.00
R. N. Sweet, Wilmington, N. C.—			
German Kainit	--------	--------	12.00
Southern Cotton Oil Company, at the following places: Abbeville, Bennettsville, Camden, Charleston, Chester, Columbia, Darlington, Dillon, Florence, Greenville, Greenwood, Laurens, Newberry, Orangeburg, Spartanburg, St. Matthews, Sumter, Union, Winsboro, S. C., and at Gibson, Goldsboro, Wilson, Selma, Fayetteville, Rocky Mount, Tarboro, Conetoe, N. C.			
Cotton-seed Meal	--------	7.50	--------
South Carolina Cotton Oil Co., Columbia, S. C.—			
Cotton-seed Meal	--------	7.50	--------
South Carolina Cotton Oil Co., Greenville, S. C.—			
Cotton-seed Meal	--------	7.50	--------
Tomlinson, Bynum & Co., Wilson, N. C.—			
Dixie Cotton Grower	8.00	2.00	1.00
Tar River Oil Co., Tarboro, N. C.—			
Cotton-seed Meal	--------	7.50	--------
R. L. Upshur, Norfolk, Va.—			
Upshur's F. C. Farmers Challenge	8.00	7.00	6.00
" 7 Per Cent Irish Potato Guano	6.00	7.00	5.00
" F. F. Farmers Favorite	8.00	5.00	6.00
" G. G. and C. Grain, Grass and Cotton Guano	8.00	2.00	2.00
" 5 Per Cent	5.00	5.00	5.00
Virginia-Carolina Chemical Co., Richmond, Va.—			
V.-C. C. Co.'s 14 Per Cent Acid Phosphate	14.00	--------	--------
Prolific Cotton Grower	9.00	2 75	2.00

LIST OF FERTILIZERS REGISTERED—Continued.

Name and Address of Manufacturer and Name of Brand.	Avail. hos. Acid.	Ammonia.	Potash
Virginia-Carolina Chemical Co., Richmond, Va.—			
Special H. G. Fertilizer for Tobacco	8.00	3.00	3.00
Farmers Favorite Fertilizer	8 00	2.00	2.00
Ajax	8.00	2.00	2.00
Blue Star	8.00	2.50	3.00
Delta	8.00	2.75	2.50
Split Silk	8.00	3.00	2.50
Selma Farmers Favorite Fertilizer	8.00	2.00	2.00
" Special H. G. Fertilizer for Tobacco	8.00	3.00	3.00
Fayetteville Farmers Favorite Fertilizer	8.00	2.00	2.00
Winston's Special for Tobacco	8.00	2.00	2.00
Fayetteville Special H. G. Fertilizer for Tobacco	8.00	3.00	3.00
Wilson Special H. G. Fertilizer for Tobacco	8.00	3.00	3.00
" Farmers Favorite Fertilizer	8.00	2.00	2.00
Rocky Mount Farmers Favorite Fertilizer	8.00	2.00	2.00
" Special H. G Fertilizer for Tobacco	8.00	3.00	3.00
" Prolific Cotton Grower	9.00	2.75	2.00
Fayetteville Prolific Cotton Grower	9.00	2.75	2.00
Wilson Prolific Cotton Grower	9.00	2.75	2.00
Selma Prolific Cotton Grower	9.00	2.75	2.00
Wilson Standard Guano	8.00	2.00	2.00
Farmers Friend Favorite Fertilizer, Special	8.50	2.00	2.00
Genuine German Kainit	-------	-------	12.00
Va.-C. C. Co.'s Special Potash Mixture	10.00	-------	4.00
Atlantic and Virginia Branch Va.-Carolina Chemical Co.—			
Carolina Truckers	7.00	7.00	7.00
Virginia Truckers	8.00	5.00	5.00
Eureka Ammoniated Bone	8.00	2.00	2.00
Eureka Ammoniated Bone, Special for Tobacco	9.00	2.50	2.00
Orient Complete Manure	8.00	2.00	1.00
Bone and Potash Compound	10.00	-------	2.00
Crenshaw's Acid Phosphate	13.00	-------	-------
Our Acid Phosphate	12.00	-------	-------
Eureka Acid Phosphate	10.00	-------	-------
Valley of Virginia Phosphate	14.00	-------	-------
Orient Special for Tobacco	8.00	2.00	2.00
Old Dominion Branch Va.-Carolina Chemical Co.—			
Old Dominion Sweet Potato Guano	6.00	2.00	6.00
Miller's Special Wheat Mixture	8.00	-------	4.00
Bullock's Cotton Grower	8.00	2.00	2.00
Old Dominion High Grade Bone Phosphate	13.00	-------	-------
" Special Wheat Guano	8.00	2.00	2.00
High Grade Alkaline Bone and Potash	10 00	-------	2.00
Farmers Friend Special Tobacco Fertilizer	8.00	3.00	3.00
Old Dominion Soluble Tobacco Guano	8.00	2.00	2.00
" Dissolved Bone and Potash	8.50	-------	2.00
" Soluble Guano	8.00	2.00	2.00
Farmers Friend High Grade Fertilizer	8.00	3.00	3.00
" " Fertilizer	8.00	2.00	2.00
Osceola Tobacco Guano	8.00	2.50	3.00
Planters Bone and Potash Mixture	10.00	-------	3.00
Old Dominion 6-7-5 Truck Guano	6.00	7.00	5.00
" 7-7-7 Truck Guano	7.00	7.00	7.00
" Potato Manure	7.00	5.00	8.00
Standard Raw Bone Soluble Guano	8.00	2.00	1.00
Isley's Formula of Dissolved Bone, Potash and Chemicals	8.00	3.00	3.00
Norfolk Soluble Bone	10.00	-------	-------
Royster's H. G. Acid Phosphate	12.00	-------	-------
Charlotte N. C. Branch Va.-Carolina Chemical Co.—			
Charlotte Acid Phosphate	13.00	-------	-------
Catawba Acid Phosphate	10.00	-------	-------
Charlotte Dissolved Bone	12.00	-------	-------
" Dissolved Bone and Potash	10.00	-------	1.00
" Ammoniated Fertilizer, C. S. M. Goods	8.00	2.50	1.50
" Ammoniated Fertilizer, Blood Goods	8.00	2.50	1.50
Catawba Guano, Blood Goods	8.00	2.00	1.00
Special 3 Per Cent Guano, Blood Goods	8.00	3.00	2.00
The Leader, Blood Goods	8.00	2.00	2.00
Charlotte Soluble Guano, C. S. M. Goods	8.00	2.50	1.00
" H. G. Special Tobacco Fertilizer, C. S. M. Goods	9.00	2.50	2.00
Queen of the Harvest, C. S. M. Goods	8.00	2.00	1.00
Groom's Special Tobacco Fertilizer, C. S. M. Goods	8.00	3.00	4.00
McCrary's Diamond Bone and Potash	8.00	-------	3.00
Oliver's Perfect Wheat Fertilizer	11.00	3.00	4.00

LIST OF FERTILIZERS REGISTERED—Continued.

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash
Powers, Gibbs & Co., Branch Va.-Carolina Chemical Co.—			
Charlotte 15 Per Cent Acid Phosphate	15.00	----	----
Charlotte Extra H. G. Wheat Fertilizer	8.00	6.00	8.00
Ten and Two Bone and Potash	10.00	----	2.00
King Cotton Grower, Blood Goods	8.00	2.00	2.00
Special 3 Per Cent Guano, C. S. M. Goods	8.00	3.00	2.00
Davie & Whittle, Branch Va.-Carolina Chemical Co.—			
Vinco Guano for Tobacco	8.00	2.00	1.00
Owl Brand High Grade Dissolved Bone	14.00	----	----
" High Grade Acid Phosphate	13.00	----	----
" Dissolved Bone	12.00	----	----
" Acid Phosphate	10.00	----	----
" Truck Guano	8.00	6.00	5.00
" Special Tobacco Guano	9.00	2.50	2.00
" Guano for Tobacco	8.00	3.00	3.00
" Guano	8.00	2.00	2.00
" Acid Phosphate and Potash	10.00	----	2.00
Double Owl Brand Guano	8.00	2.00	1.00
Powers, Gibbs & Co., Branch Va.-Carolina Chemical Co.—			
Old Kentucky H. G. Tobacco Manure	8.00	3.00	3.00
Cotton Belt Ammoniated Guano	8.00	3.00	2.00
Cotton-seed Meal Standard Guano	9.00	3.00	2.00
Carolina Golden Belt Ammoniated Guano for Tobacco	8.00	2.50	3.00
Powers' H. G. Ammoniated Guano	8.00	2.50	2.00
Gibbs' H. G. Ammoniated Guano	8.00	2.50	1.00
Eagle Island Ammoniated Guano	8.00	2.00	2.00
Almont Soluble Guano	8.00	2.00	2.00
Cotton Brand Ammoniated Dissolved Bone	8.00	2.00	1.00
" H. G. Acid Phosphate	13.00	----	----
" Acid Phosphate	12.00	----	----
Almont H. G. Acid Phosphate	13.00	----	----
" Acid Phosphate	10.00	----	----
" " Wheat Mixture	10 00	----	3.00
Dissolved Bone and Potash	10.00	----	2.00
Acid Phosphate and Potash	10.00	----	1.00
Fulps' H. G. Acid Phosphate	13.00	----	----
Finch & Harris Special Bone and Potash for Wheat and Clover	10.00	----	3.00
Cotton-seed Meal Soluble Guano	8.00	2.00	2.00
Truck Farmers Special Ammoniated Guano	8.00	4.00	5.00
Allison & Addison, Branch Va.-Carolina Chemical Co.—			
Star Brand Special Tobacco Manure	9.00	2.75	1.50
" Guano	8.00	2.00	1.00
Anchor Brand Fertilizer	8.00	2.00	2.00
" Tobacco Fertilizer	8.50	2.75	2.00
McGavock's Special Potash Mixture	8.00	----	2.25
B. P. Potash Mixture	10.00	----	2.00
Fulton Acid Phosphate	14.00	----	----
I X L Acid Phosphate	13.00	----	----
Standard Acid Phosphate	12.00	----	----
Old Hickory Guano	8.00	2.00	2.00
Star Brand Vegetable Guano	8.00	4.50	4.00
Rockette's Acid Phosphate	10.00	----	----
Durham Fertilizer Co., Branch Va.-Carolina Chemical Co.—			
Blue Ridge Wheat Grower	10.00	----	2.00
" Dissolved Bone	13.00	----	2.00
" Soluble Guano	8.00	2.00	2.00
Imperial H. G. Dissolved Bone	13.00	----	----
Blue Ridge H. G. Phosphate and Potash	10.00	----	2.00
Standard Wheat Grower	10.00	----	2.00
Standard Guano	9.00	2.00	2.00
L. and N. Special	9.00	3.00	2.00
Blacksburg Dissolved Bone Phosphate	13.00	----	----
" Soluble Guano	8.00	2.00	2.00
N. C. Farmers Alliance Official Acid Phosphate	13.00	----	----
" " " Guano	8.00	2.50	3.00
Durham H. G. Acid Phosphate	13.00	----	----
" " Acid Phosphate	10.00	----	----
Great Wheat and Corn Grower	10.00	----	1.50
Durham Bone and Potash Mixture	10.00	----	2.00
Diamond Wheat Manure	10.00	----	3.00
Special Plant and Truck Fertilizer	8.00	5.00	3.00
Progressive Farmer Guano	8.00	2.00	1.00
Golden Leaf Bright Tobacco Guano	8.00	3.00	3.00
Raw Bone Superphosphate for Tobacco	8.00	2.50	1.50

LIST OF FERTILIZERS REGISTERED—Continued.

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash
Durham Fertilizer Co., Branch Va.-Carolina Chemical Co.—			
Genuine Bone and Peruvian Guano	8.00	2.00	2.00
" " " " " for Tobacco	8.00	2.00	2.00
Raw Bone Superphosphate	8.00	2.50	1 50
Durham Ammoniated Fertilizer	8.00	2.00	1.00
Excelsior Dissolved Bone Phosphate	14.00		
Best Potato Manure	7.00	7.00	7.00
Gold Medal Brand	8.00	3.00	3.00
Carr's Special Wheat Grower	8.00		4.00
Double Bone Phosphate	13.00		
Atlas Guano, Manufactured for A. P. Branch	8.00	3.00	2.50
North State Guano, Manufactured for A. P. Branch	8.00	2.00	1.00
Standard High Grade Acid Phosphate	13.00		
" Dissolved Acid Phosphate	12.00		
" Imperial Dissolved Bone	12.00		
S. W. Travers & Co., Branch Va.-Carolina Chemical Co.—			
Beef Blood and Bone	8.00	2.00	1.00
National Fertilizer	8.00	2.00	2.00
National Special Tobacco	8.00	2.00	2.00
Capital Cotton Fertilizer	8.00	2.50	1.00
" Dissolved S. C. Bone	12.00		
Champion Acid Phosphate	10.00		
Capital Bone and Potash Compound	10.00		2.00
" Tobacco Fertilizer	8.00	4.00	3.00
Travers' Dissolved Bone Phosphate	14.00		
" Special Wheat Compound	8.00		4.00
Standard Dissolved S. C. Bone	13.00		
James G. Tinsley & Co., Branch Va.-Carolina Chemical Co.—			
Tinsley's Stonewall Tobacco Fertilizer	8.00	2.00	2.00
" Lee Brand Guano	8.00	2.00	2.00
" Richmond Brand Guano	8.00	2.00	1.00
" Irish Potato Guano	6.00	6.00	6.00
" 10 Per Cent Truck Guano	5.00	10.00	2.50
" Bone and Potash Mixture	10.00		2.00
" Dissolved S. C. Bone	13.00		
" Stonewall Brand Acid Phosphate	10.00		
" Stonewall Guano	8.00	2.00	2.00
J. G. Tinsley & Co.'s Tobacco Fertilizer	8.00	4.00	2.50
Tinsley's Strawberry Grower	6.00	4 00	4.00
Killikinnick Tobacco Mixture	8.00	2.50	3.00
Powhatan H. G. Phosphate	14.00		
Southern Chemical Co., Branch Va.-Carolina Chemical Co.—			
Pilot Ammoniated Guano, Special for Tobacco	8.00	2.50	3.00
Tar Heel Acid Phosphate	12.00		
Winston Bone and Potash Compound	10.00		2.00
Mammoth Wheat and Grass Grower	10.00		2.00
Comet 16 Per Cent Phosphate	16.00		
Red Cross 14 Per Cent Acid Phosphate	14.00		
Reaper Grain Application	12.00		3.00
Winner Grain Mixture	10.00		4.00
Electric Standard Guano	8.00	2.00	2.00
Yadkin Complete Fertilizer	8.00	2.00	1.00
George Washington Plant Bed Fertilizer for Tobacco	8.00	3.00	2.50
Electric Tobacco Grower	8.00	2.00	2.00
Victor H. G. Acid Phosphate	13.00		
Farmers Pride Bone and Potash Mixture	10.00		3.00
Shinbone Meal, Real Animal Bone		3.50	
Garden and Fruit Special	8.00	4.00	5.00
Sun Brand Guano	9.00	2.50	5.00
Click's 16 Per Cent Acid Phosphate	16.00		
Chatham Acid Phosphate	13.00		
Elkin Acid Phosphate	12.00		
Horseshoe Brand Acid Phosphate	10.00		
Quickstep Soluble Bone and Potash	10 00		1.00
Prize Bone and Potash	8.50		2.00
Mammoth Corn Grower	10.00		2.00
Norfolk and Carolina Chemical Co., Branch Va.-Car. Chem. Co.—			
Pretlow's Champion for Peanuts, Cotton and Corn	8.00	2.00	1.00
Cooper's Special Bright Tobacco Fertilizer	8.00	2.50	3.00
Amazon H. G. Manure	8.00	3.00	3.00
Genuine Slaughter-House Bone	8.00	2.00	2.00
" " " " Special for Tobacco	8.00	2.50	2.00
Crescent Brand Ammoniated Fertilizer	8.00	2.00	1.00
Bright Leaf Tobacco Grower	8.00	3.00	3.00
Norfolk Best Acid Phosphate	13.00		
" Reliable Acid Phosphate	10.00		

LIST OF FERTILIZERS REGISTERED—Continued.

Name and Address of Manufacturer and Name of Brand.	Avail. Phos. Acid.	Ammonia.	Potash
H. Weil & Bro., Goldsboro, N. C.—			
Genuine German Kainit	--------	--------	12.00
Williams & Clark Fertilizer Co., New York and Charleston, S. C.—			
Americus Ammoniated Bone Superphosphate	8.00	2.25	1.00
T. W. Wood & Sons, Richmond, Va.—			
Standard Grain and Grass Fertilizer	8.00	2.00	2.00
" Vegetable Fertilizer	8.00	3.00	3.00
" Potato Fertilizer	8.00	3.00	3.00
Wood's Pure Animal Bone total	23.00	3.00	--------
" Lawn Enricher	5.00	3.00	3.00
W. H. Warriner & Co., Ruffin, N. C.—			
North Carolina Special	9.25	2.50	2.00
W. H. Worth & Co., Raleigh, N. C.—			
Apex Ammoniated	8.00	2.00	1.00
Bone and Potash	10.00	--------	2.00
Guilford Acid Phosphate	13.00	--------	--------
Ocala Ammoniated Guano	8.00	2.00	2.00
Standard Ammoniated Guano	8.00	2.50	3.00
Truckers Friend	6.00	6.00	6.00
E. F. Young, Dunn, N. C.—			
Young's Special Compound for all Crops	8.00	2.00	2.00
S. H. Ward & Sons, Jamestown, N. C.—			
Pure Raw Bone Meal	21.00	4.50	--------
Virginia State Fertilizer Co., Farmville and Lynchburg, Va.—			
Va. State Bone and Potash	10.00	--------	2.00
" Truck and Tomato Grower	8.00	5.00	5.00
Gilt Edge Brand Pure Bone Meal total	20.00	4.00	--------
Bull Dog Soluble Guano	8.00	3.00	3.00
G. E. Special Tobacco Guano	8.00	2.50	2.00
Austrian Tobacco Grower	8.00	2.50	2.00
Game Cock Special Guano	8.50	2.00	2.00
Virginia State H. G. Guano	8.00	2.00	2.00
Battle Axe Tobacco Guano	8.00	2.00	2.00
Virginia State H. G. Tobacco Guano	8.00	2.00	2.00
Highland King	8.00	2.00	1.00
Bull Run Acid Phosphate	16.00	--------	--------
Gilt Edge Brand Acid Phosphate	14.00	--------	--------
H. G. Dissolved Bone and Potash	10.00	--------	2.00
Gilt Edge Dissolved Bone and Potash	8.50	--------	2.00
Lurich Acid Phosphate	10.00	--------	--------
Alps Brand Acid Phosphate	12.00	--------	--------
Clipper Brand Acid Phosphate	13.00	--------	--------
Dunnington's Special Formula for Tobacco	8.00	3.00	3.00
Genuine German Kainit	--------	--------	12.00
Double X High Quality Guano	8.00	4.00	6.00
Nitrate of Soda	--------	18.00	--------
H. G. Sulphate of Potash	--------	--------	47.00
S. C. Vann, Franklinton, N. C.—			
Pilot Guano, Special Compound	10.00	2.50	3.00
" Special 4 Per Cent	10.00	2.50	4.00

EXTRACT FROM THE REPORT OF THE COMMITTEE OF THE BOARD OF AGRICULTURE, SENT TO CHARLESTON TO EXAMINE THE N. C. EXHIBIT.

"The Committee met at the exhibit of the Board on the Exposition grounds at 9 o'clock, A. M., April 8. Present, J. B. Coffield, E. L. Daughtridge, W. A. Graham and A. Cannon. By designation of the Commissioner, W. A. Graham, presided. The committee examined the exhibit of the Board and then of other States. The North Carolina display was notably the best of any of the States, except perhaps that of South Carolina; but taking into consideration that the latter had ten times the amount of space that was allotted to the former we can hardly acknowledge the superiority. The arrangement in appearance and for the examination of those interested in particular articles, was decidedly the best on the entire grounds. The object of the exhibit was not to show the curiosities and monstrosities to be found in the State, but what there was in different departments inviting investment of capital; the article exhibited was only a duplicate or sample of what could be found by those seeking such investments. The credit for the excellent arrangement is due to Mr. T. K. Bruner, Secretary of the Board, who was most efficiently aided in his work by Mr. Brimley, Curator of the Museum.

"Report on expenditures is deferred until the Exposition is closed and all papers can be examined.

"W. A. GRAHAM,
"J. B. COFFIELD,
"E. L. DAUGHTRIDGE,
"A. CANNON,
Committee."

NORTH CAROLINA AT CHARLESTON—IT HAS THE BEST AND MOST VARIED EXHIBIT OF ANY STATE IN THE UNION.

[Raleigh News and Observer.]

The North Carolina exhibit at the South Carolina Inter-State and West Indian Exposition is divided into five sections. The central space is surmounted by an ornate pagoda, under which are four plate-glass cases of choice exhibits and the office of the North Carolina Commissioners. In the cases are more than five hundred cut gems, gem stones, rare minerals, and a large display of gold nuggets and native silver, the arrangement being at once artistic and pleasing, the color scheme of gold and olive green being carried out in the ornamentation of each section.

The list of gems is a long one, in the collection being amethyst, beryls, sapphires, cat's eyes, garnet, rhodolites, almandines, Hiddenites, valued at $150 a caret, and many others.

The other four sections surrounding the central space are devoted to exhibits of mines and building stones, forestry, agriculture and horticulture.

In the mining section are gold, silver, copper and iron ores of the State, and following these the economic minerals, such as kaolin, asbestos, mica,

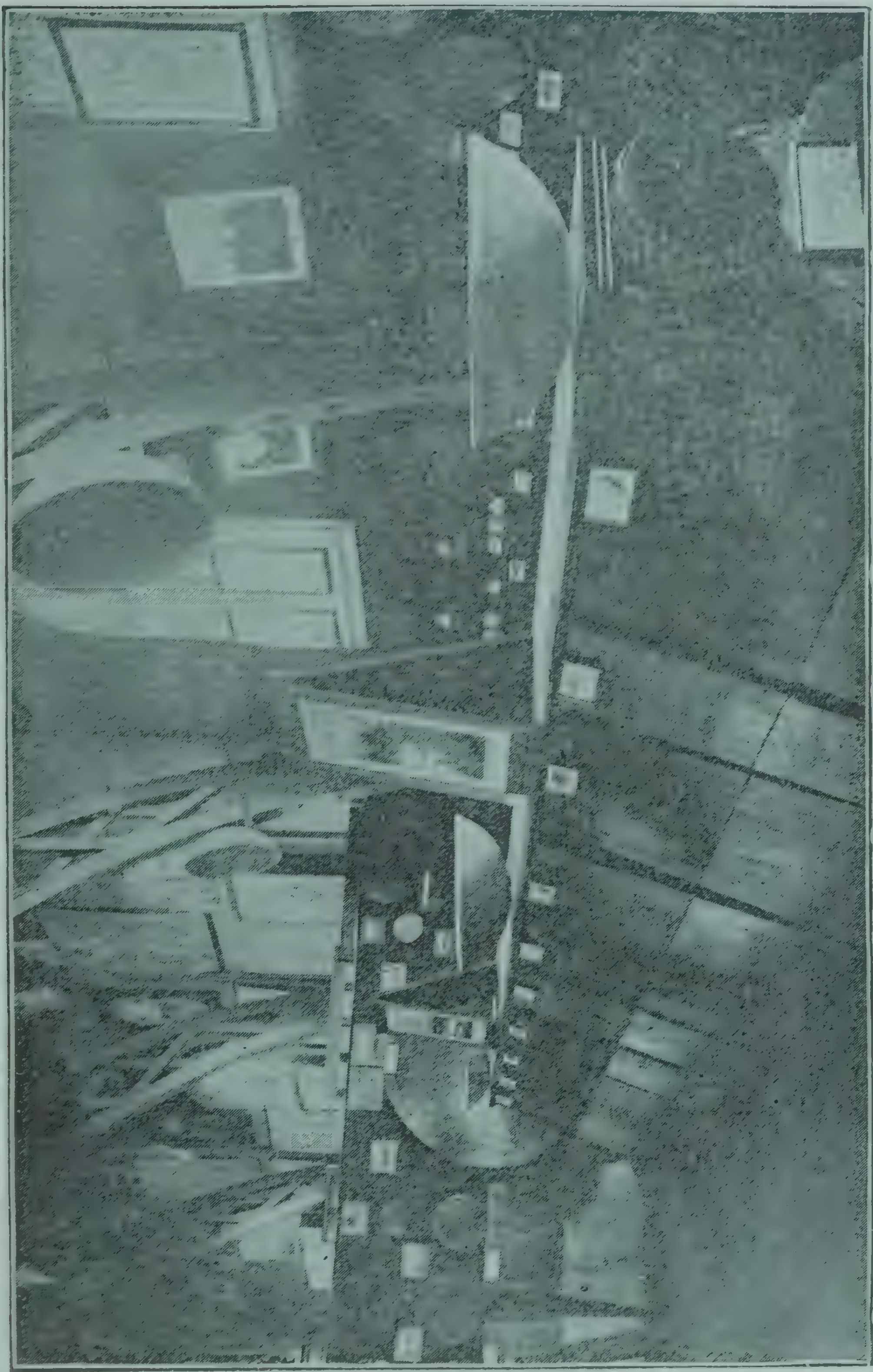

CAROLINA

talc, monazite, zircon, graphite. Above this superb collection are the marbles, granite, gneiss and brown stones.

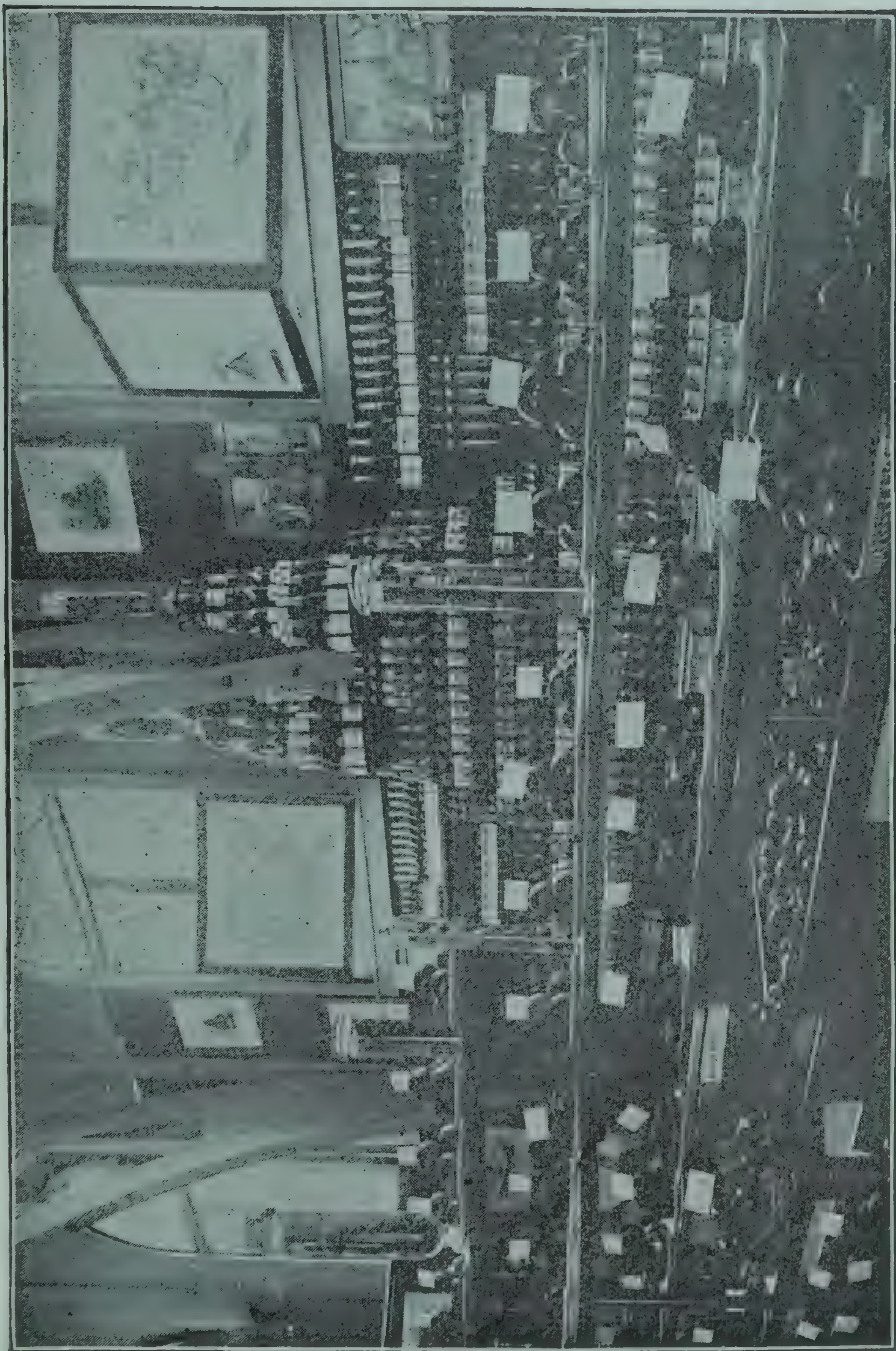
In the forestry section across the aisle is one of the best exhibits on the grounds, consisting of a splendid selection of trees, showing cross-sections in a natural and highly polished state, the discs being magnificent specimens of the forestry product of North Carolina.

The next section shows the agricultural display, which is highly praised. On the walls the sheaf wheat is ornately displayed, while in 350 glass tubes are the shelled grains, seeds, etc., from all sections of the State. In four large cherry cases is shown the tobacco and cotton exhibit.

Then comes the horticultural section, a revelation even to North Carolinians. Vegetables from the trucking fields, peaches, pears, grapes, plums, Japanese persimmons, apricots, cherries, etc., and a great central pyramid of wines. Then there is the splendid collection of apples from the mountain section, notably from Yancey, Mitchell, Haywood, Madison and Caldwell.




ANTHONY



THE BREEDS OF BEEF CATTLE AND THEIR SELECTION.

BY DR. TAIT BUTLER, STATE VETERINARIAN.

Numerous inquiries for information concerning the breeds of beef cattle and other problems relating to live stock husbandry received by this Department indicate that there is in this State, just at this time, an unusual interest in the subject of beef production. This interest is, no doubt, partially due to the high price of prime beef cattle on the leading markets of the country, being the highest since 1882, and reaching on July 16, 1902, $8.75 per hundred pounds live weight. These high prices make it apparent that on the cheap lands of North Carolina, with their natural tendency to grass growing, cattle could be raised at a profit far in excess of that realized from the present system of agricultural production. Moreover, it is probably being realized to a degree never before approached that the expenditure of $6,000,000 annually for commercial fertilizers is a tax which no system of agriculture can permanently withstand. This vast sum is too great a tax for the farmers of this State to pay annually for the privilege of being relieved from the personal care and attention which the growing of live stock entails.

It is also being realized, as Northern and European feeders become better acquainted with the merits of cotton-seed meal as a cattle food, and year by year gradually force its price higher and higher, that it is becoming too expensive to use as fertilizer, unless its food value can also be utilized before putting it into the soil. The farmers of this State use about $2,000,000 worth of cotton-seed meal for fertilizer and thereby waste $2,000,000 worth of the best cattle food known to the civilized world. Considering the price of other food stuffs, cotton-seed meal is now selling for more than 25 per cent below its real food value; while if fed to cattle, fully 75 per cent of its fertilizer constituents are retained on the farm, thus making it apparent that the $2,000,000 spent annually for cotton-seed meal, to be used as fertilizer, is a direct and positive waste of $2,000,000 worth of cattle food.

The importance of these facts, and others of a like nature, is becoming more fully realized by the farmers of the State, and they are asking in rapidly increasing numbers for information on live stock subjects. To, in a measure, supply this demand in regard to the breeds of beef cattle and other subjects relating to beef production, this bulletin has been prepared.

THE STUDY OF CORRECT BEEF FORM.

The first step toward the successful growing of beef cattle is the acquirement of a correct knowledge of the essential attributes of the best beef-producing animals. The quickest and easiest way to obtain that knowledge is to have those qualities which tend to the highest excellence in beef production pointed out by one who knows, using a good type of the live animal for illustration. A less satisfactory method, but one which must frequently be resorted to, is to read a good written description of the ideal beef form, study the best photographs of high-class animals, and compare both of these with the best specimens of the live animal that are available. While, as stated,

this latter method is not so satisfactory as the former, still any intelligent man can, by following it for a sufficient time, finally become perfectly familiar with the accepted beef type or form. This generally accepted beef type does not belong to any particular breed of cattle, but nevertheless it must be possessed by any animal to bring the highest price on the market, or what amounts to the same thing, produce the largest proportion of the best beef. For the present it will be well to accept this fact and devote our attention to a detailed description of what constitutes this best beef type or form.

In doing this illustrations will be used, and we advise the reader to avoid the common error of assuming that these illustrations are extreme exaggerations, or not true pictures of real animals. For the most part they represent, with a fair degree of accuracy, animals, which possess ,to a high degree, the particular characteristics sought to be illustrated. In short, they are not entirely ideal pictures, but reproductions on paper of real live animals, and as such they should be accepted and studied while reading the written description of the separate points.

The following illustrations (figures 1 and 2) and the subjoined key will enable the reader to locate any point which may be referred to in subsequent descrptions.

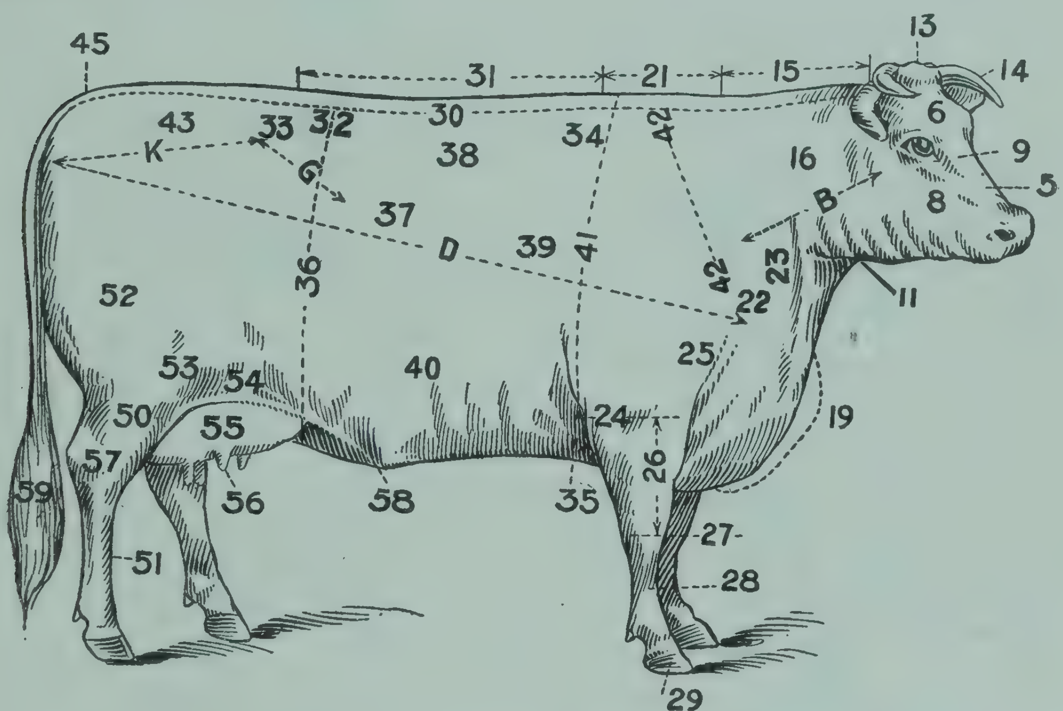
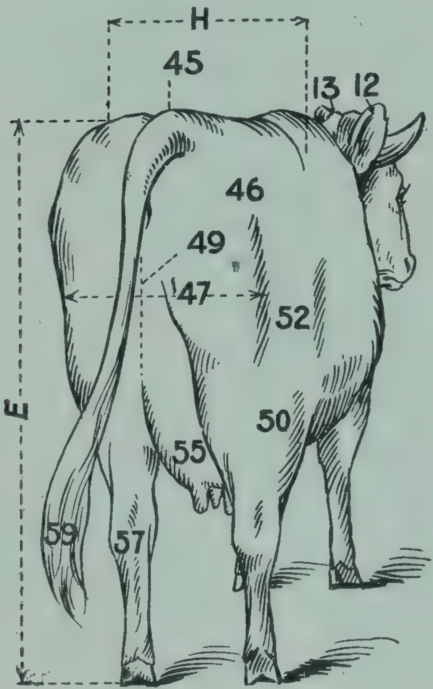


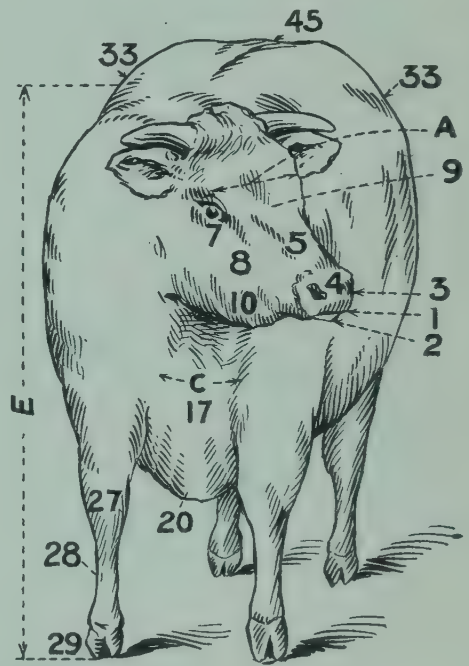
FIG. 1.—Points of Beef Cattle.

NAMES OF PARTS.

1. Mouth.
2. Lips.
3. Nostrils.
4. Muzzle.
5. Nose.
6. Forehead.
7. Eye.
8. Cheek or side of face.
9. Face.
10. Lower jaw.
11. Throat.
12. Ear.
13. Poll.
14. Horns.

15. Neck.
16. Neck—side view.
17. Front of chest—breast or bosom.
19. Dewlap.
20. Brisket.
21. Withers.
22. Shoulder point.
23. Shoulder vein.
24. Elbow.
25. Chest, or thoracic cavity.
26. Arm, or forearm.
27. Knee.
28. Cannon.
29. Hoof.
30. Backbone.
31. Barrel, or body.
32. Loin.
33. Hooks, or hips.
34. Crops.
35. Fore flank.
37. Hind, or floating ribs.
38. Chine.
39. Mid rib.
40. Belly.
42. Shoulder.
43. Rump.
45. Tail head.
46. Pin bones.
47. Buttock.
49. Twist.
50. Gaskin, or lower thigh.
51. Shank.
52. Thigh.
53. Stifle.
54. Hind flank.
55. Udder or purse.
56. Teats.
57. Hock.
58. Navel.
59. Brush, or switch.





2a FIG. 2.—Points of Beef Cattle. 2b

MEASUREMENTS.

A. Width of forehead.
B. Length of neck.
C. Width of breast.
D. Length from pin bones to shoulder point.
E. Height at withers and hips.
41. Girth at fore flank.
36. Girth at hind flank.

G. Length of space between point of hip and last rib.
H. Width across hips.
K. Length of rump.

SCALE OF POINTS.

A knowledge of the relative value of the different points, as well as the ability to institute accurate comparisons between the ideal beef form and the animal under examination, is of the highest importance if we are to become good judges.

While it is true that the score card is not used by expert judges of beef cattle in the show ring, nor do the most discriminating buyers of stockers and feeders think of literally applying it to the cattle examined, still both these classes of practical judges really do precisely this same thing, in effect. Moreover, nothing more quickly or effectively shows the novice, the relative value and importance of the different points or parts than a numerical estimate of their relative value. This is commonly called a "score card." No generally accepted numerical valuation of the different parts exists, but those used only vary slightly, according to the fancies of the teacher. The following is not far from an average of those used and will serve the purpose of this Bulletin in calling attention to the relative value or importance of the different points in an ideal or perfect animal:

SCALE OF POINTS—BEEF CATTLE—STEERS.

NAME OF POINTS.	PERFECT SCORE.
General Characters:	
Weight, according to age	8
Form	10
Quality	8
Condition	6
Head and Neck:	
Muzzle	1
Eyes	1
Face	1
Forehead	1
Ears	1
Neck	3
Fore Quarters:	
Shoulders	3
Shoulder vein	2
Brisket	2
Dewlap	1
Legs	2
Body:	
Chest	6
Ribs	8
Back	10
Loin	8
Flank	2

NAME OF POINTS.	PERFECT SCORE.
Hind Quarters:	
Hips	3
Rump	3
Pin bones	1
Thighs	3
Twist	2
Tail	1
Purse	1
Legs	2
Total or perfect score	100

By reference to the foregoing scale of points it will be observed that the chief characteristics of correct beef form are in the order of their importance about as follows:

1. A vigorous constitution and a neat, compact, fleshy form.
2. A straight back that has breadth throughout and is thickly covered with flesh.
3. Good hind quarters, long, wide, deep and smooth.
4. Good "handling" qualities as indicated by evenly distributed elastic flesh and a pliant skin.
5. Good fore quarters that are full and of even depth and width with hind quarters.

DESCRIPTION OF CORRECT BEEF FORM.

After the foregoing general considerations it will be well to devote some attention to a detailed description of the proper form and characters of the different parts of the typical or ideal beef animal.

Size.—The size should be above, rather than below, the average for age and breed. The beef breeds vary somewhat in weight at maturity, but it must be remembered that size is much more a question of feed and care than of breed. Under what may be termed high-pressure feeding calves of any of the beef breeds may weigh from 800 to 1,000 pounds when one year old, and from 1,400 to 1,600 pounds at two years, but where pasturage and rough feed are abundant and grain feeds scarce, profitable beef may be produced by steers that do not reach more than 1,300 to 1,500 pounds at from three to three and a half years old.

General Form.—The body should approach a parallelogram in shape; that is, the top line or back should be straight, while the under line should be parallel with it throughout. The sides should be even and full, giving the body the same width at all points. Reference to figures 3, 13 and 35 will show how closely the beef type conforms to these requirements, while figures 4, 14, 36 and 37 show how far the form of the dairy cow and the scrub depart from it.

Head.—The head should be of medium size and short and broad, but clean cut and neat, although somewhat massive in appearance. See figures 5 and 15, and compare these with figures 6, 7 and 36 to show the different types.

(a) *Muzzle.*—Large and moist. Figures 5 and 16.

(b) *Nostrils.*—Medium to large and flexible. Figures 5 and 19.

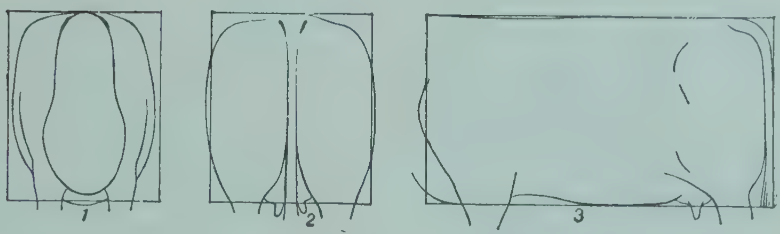


FIG. 3.—Outlines of Shape of Beef Cow as Compared with Parallelograms. (From Soule, U. S. Dept. of Agriculture.)

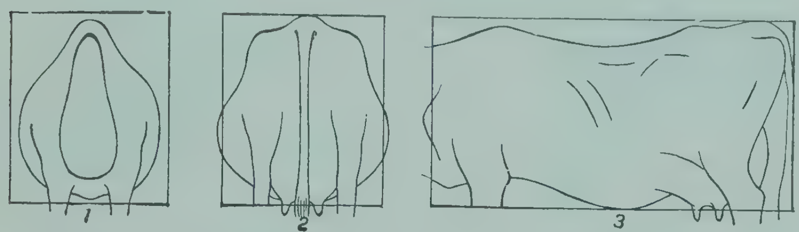


FIG. 4.—Outlines of Shape of Dairy Cow as Compared with Parallelograms. (From Soule, U. S. Dept. of Agriculture.)

(c) *Nose.*—Medium length and straight. Figures 5 and 15.

(d) *Eyes.*—Large, prominent and bright, but calm.

(e) *Face.*—Broad between the eyes and only slightly dished. Figures 5 and 18.

(f) *Forehead.*—Broad and full. Figure 5.

(g) *Horns.*—When horns are present they should be of proper type for the breed, of medium size and fine texture. Figures 15 and 21.

(h) *Ears.*—Medium in size with a tendency to be broad rather than too long, and carried in a manner to indicate vigor, but not nervousness. Well covered with soft hair, varying, especially as to length, in the different breeds. Figures 18 and 20.

Neck.—It should be rather short and quite thick; neat and clean cut at the head, but gradually increasing in size backwards, becoming thick, full and large and blending evenly with the body. See figures 8 and 15 for beef type and compare with figures 9 and 14, which show opposite types.

Back.—It should be straight, broad, and smooth from neck to tail head, and especially well covered with firm elastic flesh throughout. See figures 10 and 16.

Fore Quarters.—They should be wide, deep and full, but at no point developed in excess of the hind quarters so as to destroy that evenness of the side, top and under lines.

(a) *Withers.*—Broad from side to side, level and well covered with flesh.

(b) *Shoulders.*—Only moderately sloping and well covered with flesh so as to blend with the shoulder vein and flesh over the ribs in such a manner as to give smoothness.

(c) *Chest.*—Large and broad, especially at lower part, so as to give large lung capacity. See figure 16.

(d) *Breast.*—Broad, deep and full.

(e) *Brisket.*—Neither narrow nor prominent.

(f) *Arm.*—Large and full, but tapering gradually towards the knee.

FIG. 5.—Typical Heads of Beef Cattle.
(From Soule, U. S. Dept. of Agriculture.)

FIG. 6.—Typical Heads of Dairy Cattle.
(From Soule, U. S. Dept. of Agriculture.)

FIG. 7.—Heads Native Steers Deficient in Quality.
(From Soule, U. S. Dept. of Agriculture.)

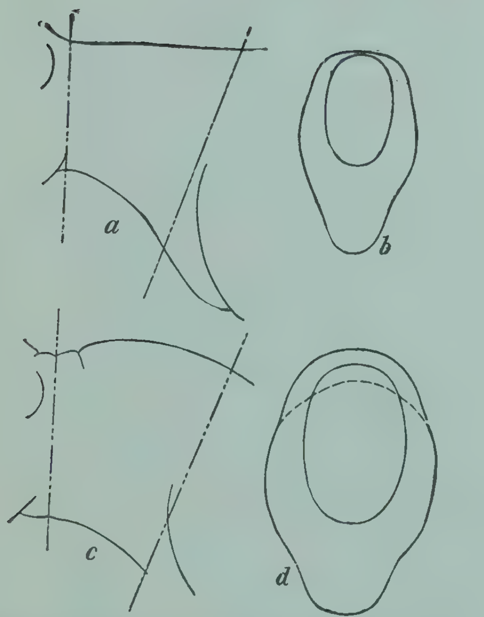


FIG. 8.—Necks of beef cattle; *a*, side view of cow's neck; *b*, front view of same; *c*, side view of bull's neck; *d*, front view of same.

(From Soule, U. S. Dept. of Agriculture.)

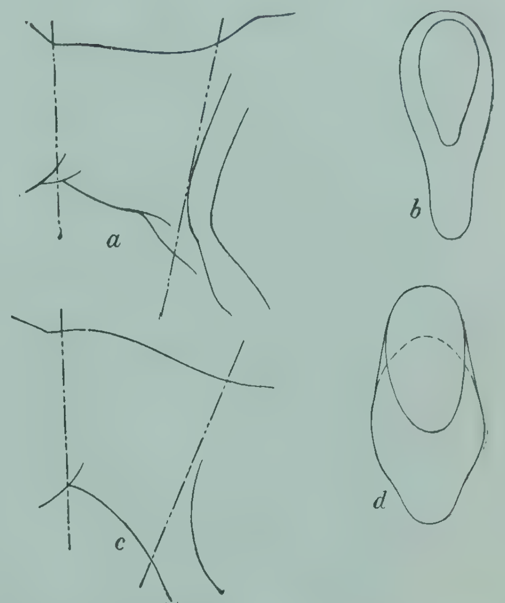


FIG. 9.—Necks of dairy cattle; *a*, side view of cow's neck; *b*, front view of same; *c*, side view of bull's neck; *d*, front view of same.

(From Soule, U. S. Dept. of Agriculture.)

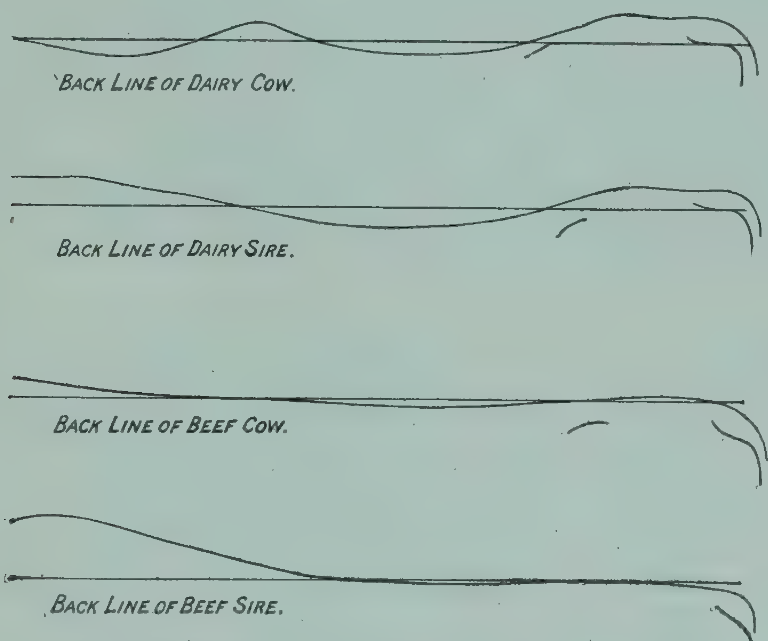


FIG. 10.—Back or Top Lines of Beef and Dairy Animals.
(From Soule, U. S. Debt. of Agriculture.)

(g) *Legs.*—Short, hard and clean, with a moderately straight pastern.

(h) *Feet.*—Medium size, with firm, tough hoofs, squarely placed.

Body or Barrel.—Not too long, but wide and deep with no indication of undue abdominal distension, except in the female. See figures 11 and 20.

(a) Ribs, springing out from the backbone, so as to give great thickness to the body, and running back close to the hips.

(b) *Crops.*—Well filled out so as to form an even surface from shoulder to ribs.

(c) *Fore Flank.*—Full well down to the under line of the body.

(d) *Hind Flank.*—Full and thick well down to the under line.

FIG. 11.—Development of Barrel in Beef and Dairy Cattle.
(From Soule, U. S. Dept. of Agr.)

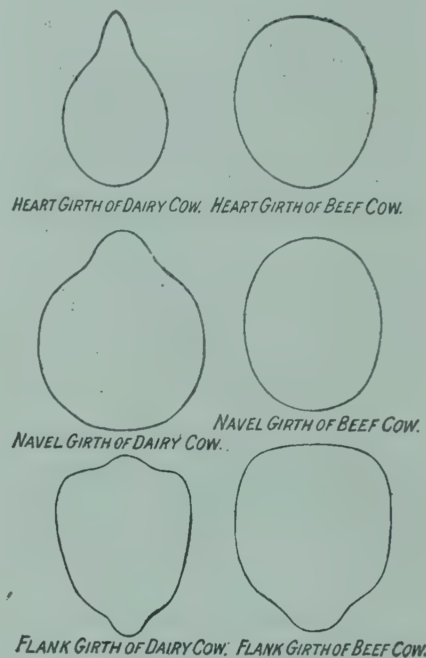


FIG. 12.—Girths of Beef and Dairy Cows.
(From Soule, U. S. Dept. of Agr.)

(e) *Under Line.*—As nearly straight as possible; that is, the same distance from the back or top line throughout. See figures 11 and 20.

(f) *Girth.*—About the same at the fore and hind flanks. See figures 12 and 22.

Hind Quarters.—Broad from side to side and long from hooks to tail head, hind flanks and hocks; level, full and square. See figures 13 for proper form of hind quarters and mark its contrast from that of the dairy cow and scrub steer shown in figures 14 and 37.

(a) *Hips.*—Full, smooth and level on top. See figures 13 and 37.

(b) *Thighs.*—Large and plump, with fullness extending well down as they taper towards the hocks. See figure 13 for proper form, and figure 14 for dairy form.

(c) *Buttock.*—Broad and straight, or slightly convex from tail head to hock. Figures 13 and 15 for correct beef type.

(d) *Twist.*—Full well down towards the under line.

(e) *Tail.*—Broad at tail head, but medium fine below and straight.

Legs.—Short, straight and medium size, but hard and clean and placed firmly and squarely under each corner of the box-shaped body.

Skin.—In thickness varying somewhat with the breed, but mellow and elastic and covered with a thick coat of fine soft hair.

Style.—There should be a graceful, active carriage, but nothing approaching nervousness or sluggishness—a symmetry of parts with quality throughout.

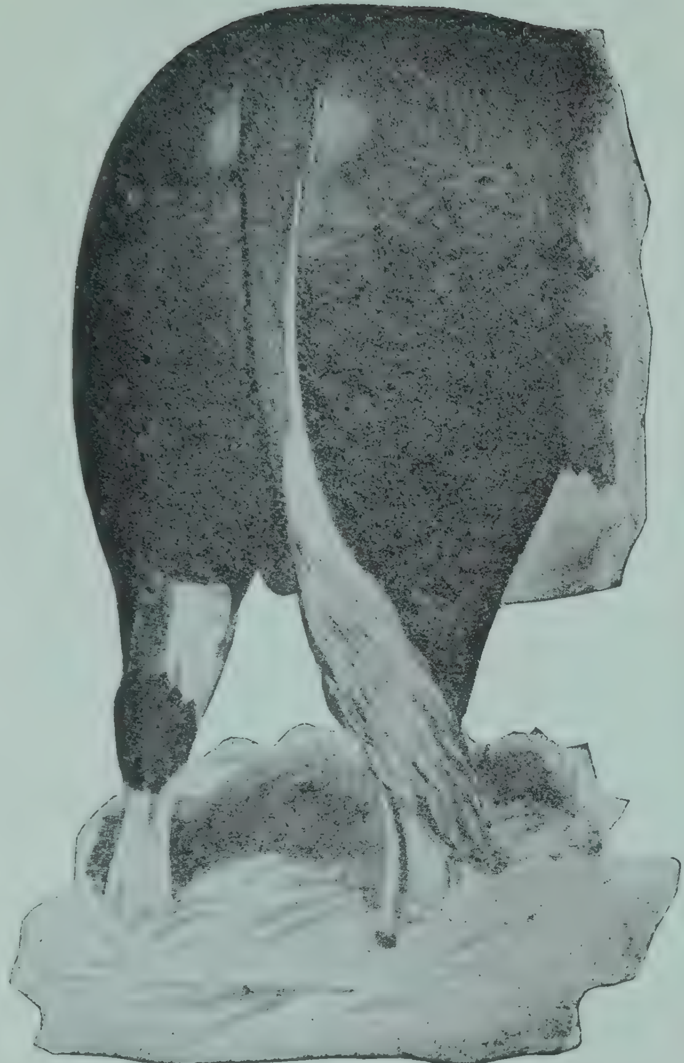


FIG. 13.—Hind Quarters of Bull Showing Beef Type.

FIG. 14.—Jersey Cow, Melia Ann 2d's Best, showing dairy form of hind quarters. Owned by J. Gerow Dutcher, Pawling, N. Y.
(By courtesy of Jersey Bulletin.)

Regardless of age and condition, an animal of the approved beef type will show natural flesh; that is, large muscles or red meat. This is an inherited quality and an essential one. The animal that is poor will not show the smoothness of the well-fed one, but he must show flesh, muscle.

SPECIAL BEEF BREEDS.

Of the breeds that show special beef qualities not more than four need be considered in this Bulletin, as follows: Short-horn, Polled Angus or Aberdeen-Angus, Hereford and Galloway.

A brief consideration of the distinguishing characteristics of each of these breeds may serve a useful purpose.

SHORT-HORNS.

In North Carolina this breed is still quite generally known by the now obsolete name "Durham." Up-to-date stockmen now seldom use any other term to denote the breed than Short-horn. This is, perhaps, well, to avoid confusion, since a polled variety of the breed has been developed which is called Polled Durham. See figures 17 and 18.

The breed was first imported into this country from England, in 1815, and from its adaptability to our climatic and other conditions has become the most numerous of all the beef breeds. A majority of all the better grades of beef cattle going to the principal markets of the country, being either Short-horns or Short-horn grades.

In color these cattle are either red, white or some combination of these two colors, red and white spotted and roans being not uncommon. In this and other Southern States one frequently hears the pure breeding of an animal of this breed questioned on the ground that it is not pure red or nearly so. While this is, of course, absurd, it may be stated that in the past, and even at present, the red color is most fashionable with many breeders; still, mixed colors, especially the red roan, are not at all objectionable in the eyes of the feeders. Uniformity, even in color, is desirable, but the lack of this in Short-horns is, at most, but a trifling objection.

In size the Short-horn probably ranks first among the beef breeds. Mature bulls that weigh 2,500 pounds and cows that reach 2,000 pounds are not uncommon. These extreme weights are only reached with age and liberal feeding. In conformation the Short-horn is characterized by a particularly strong and beautiful head, a neck of medium length; back and hindquarters particularly broad, even, square and well fleshed, and to probably a greater degree than any other breed, a rectangular or box-shaped general outline of body, with fine style and carriage.

The strong points of the breed are adaptability to diverse climatic and other conditions, great size, early maturity, unexcelled feeding qualities, large proportion of dressed to live weight, and, perhaps, unequalled crossing qualities for the production of fine grades. The weak points of the breed are, that they are only average grazers, being better adapted to rich pastures and liberal feeding, and that the meat is somewhat coarse, not so highly flavored, and the fat and lean not quite so nicely distributed as in some breeds.

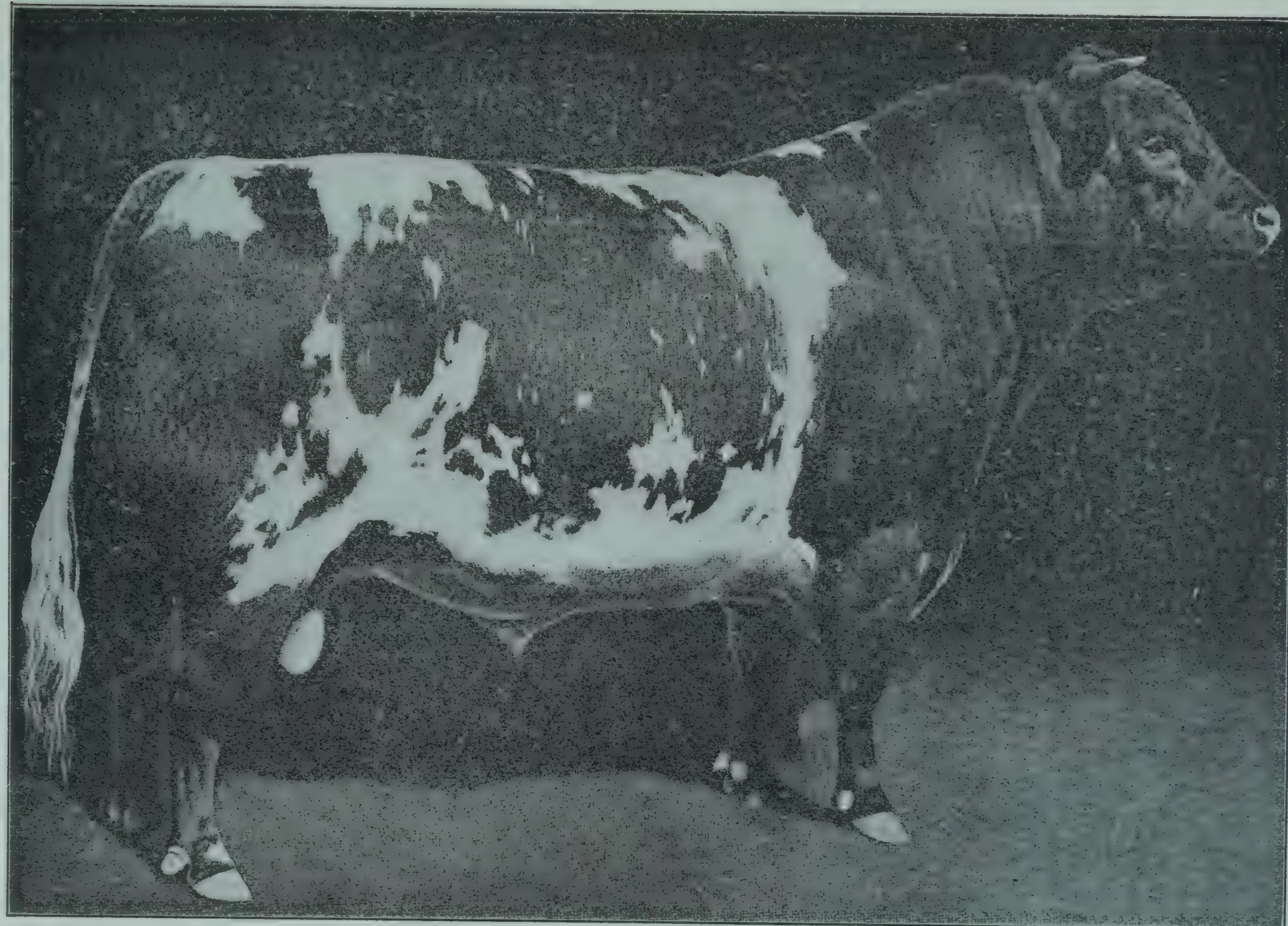


FIG. 15.—Famous Short-horn Bull St. Valentine, 121014.

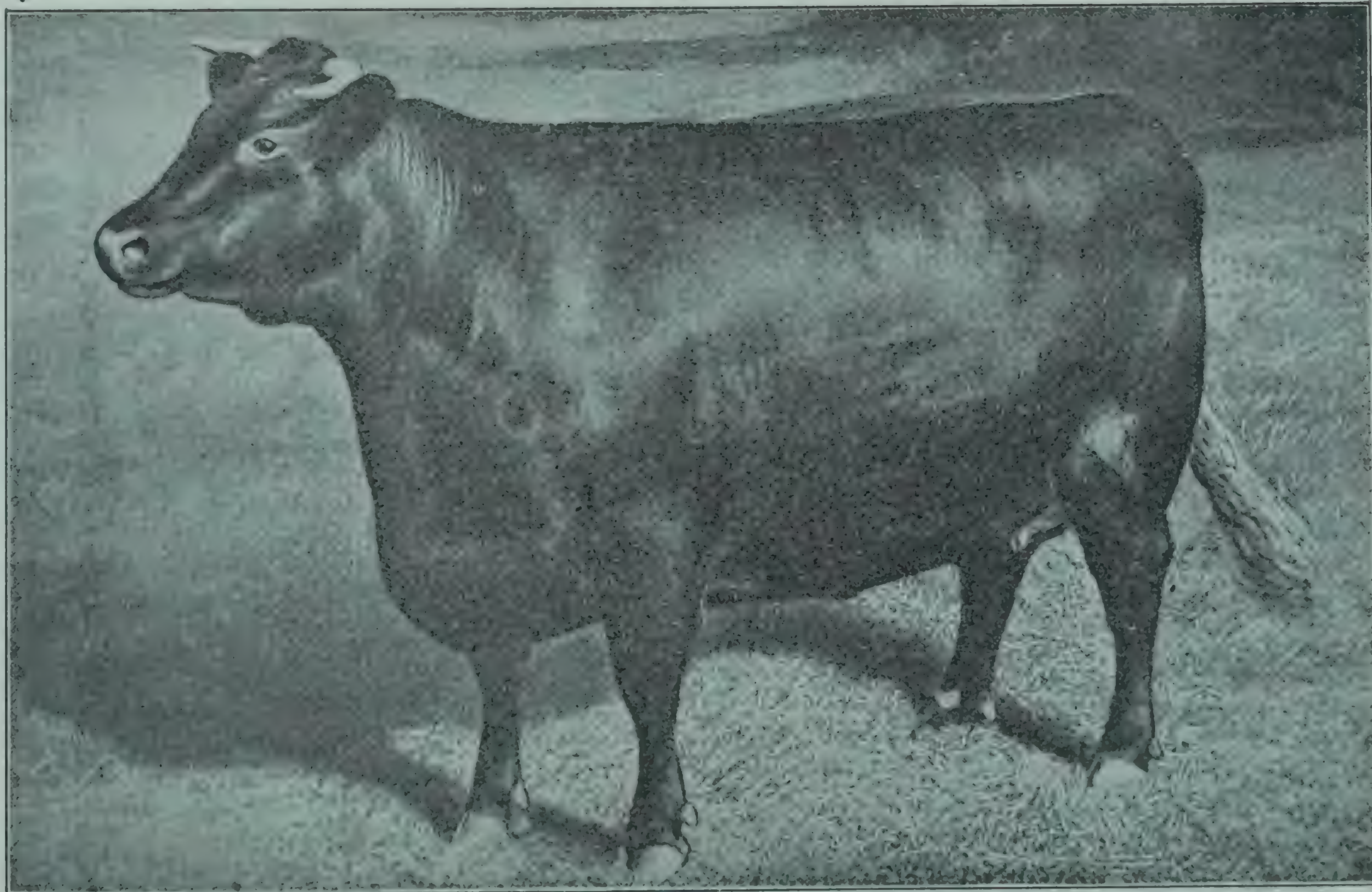


FIG. 16.—Short-horn Cow Sweet-Violet 2d, sold at auction for $3,705.

FIG. 17.—Polled Durham Bull Tippecanoe 44th. Owned by Fletcher S. Hines, Indianapolis, Ind.

FIG. 18.—Polled Durham Heifer. (By courtesy of Fletcher S. Hines, Indianapolis, Ind.)

POLLED DURHAMS.

A polled variety of the Short-horn breed has been developed which is frequently spoken of as a separate or distinct breed. They are in all essentials simply Short-horns, lacking the horns. In fact, one variety is descended from pure-bred Short-horns, its members being eligible to registration in both the Short-horn and Polled Durham Herd Books. These are consequently known as "Double Standard" Polled Durhams, and were, of course, developed from the "sports," or hornless animals, which occasionally appear in pure-bred herds.

The other variety was developed by crossing pure-bred Short-horns on the "Muley," and are known as "Single Standard" Polled Durhams.

FIG. 19.—Aberdeen-Angus Bull Orin of Longbranch.
(From Rommel, U. S. Dept. of Agriculture.)

ABERDEEN-ANGUS.

Although this old Scotch breed was not imported into this country until 1873, it has rapidly grown in popularity, until to-day more pure-bred cattle are being registered annually in the American Herd Book than in Scotland. Unfortunately different names are sometimes applied to the breed, such as Aberdeen-Angus, Polled Angus, Polled Aberdeens, etc. The "doddies," as they are also sometimes called, are black and hornless, but occasionally small stubs of horns, called "scurs," appear, and white along the under line is not uncommon; while a red or brown tinge to the hair is occasionally seen. The

presence of abortive horns or scurs, white above the under line or on the legs, or a red color, disqualifies bulls for registration.

The general form of the body is quite characteristic, being extremely round and smooth, as regard bony prominences; very compact, and set on short, well-placed legs.

The head is also typical and a remarkably true index of the character of the animal to which it is joined. The broad forehead and beautifully bright eyes indicate that nerve vigor for which the breed is noted.

The chest is deep and capacious, while the hindquarters are smooth, the hook and pin bones being remarkably well covered with flesh, but in width there is not infrequently a noticeable deficiency. The tail is set a little too far forward and the buttocks are decidedly rounded, but the thighs are large and well fleshed down close to the hocks.

The tendency to coarse shoulders, producing a deficiency at crops, and narrow rumps are perhaps their chief weaknesses in form.

In size they are somewhat less than the Short-horns, but this is not a serious objection, for, with fair treatment, mature males frequently weigh over 2,000 pounds, and females 1,500 to 1,800 pounds. They mature early and under favorable conditions are excellent feeders, but on short feed, while they keep in better flesh than either the Short-horns or Herefords, they probably do not grow as large frames, hence, under such conditions, if not finished for market until advanced in age, they may not make quite as satisfactory feeders.

Their grazing and rustling qualities are only medium, being in this respect much on the line with the Short-horns.

The proportion of dressed carcass to gross weight is large and the quality of the meat unexcelled. They cross well on Short-horns or the native cattle, their prepotency being shown by the fact that from 80 to 90 per cent of the calves will be hornless, and a large percentage of them black.

HEREFORDS.

This breed, as its name indicates, originated in Herefordshire, England, and were probably first imported to this country by Henry Clay, in 1817, but not until about 1880 did their popularity become general. Since then they have held a leading place on the Western ranges and rapidly increased in popularity and numbers throughout the beef-growing sections of the whole country.

In color they are uniformly red and white, the markings being characteristic and striking. The head, top of the neck, dewlap, brisket, belly, front feet, hind legs below the hocks, and brush of the tail are white, and sometimes also the back and other parts of the body. All other parts are red, and while the shade varies considerably, the most desirable one is neither too light nor very dark. The ears are usually spotted or pure red, and red spots are frequently found on the head around the eyes.

In size the Hereford is nearly, if not quite, equal to the Short-horn. In form they are low and extremely wide, and while less round than the Polled Angus, they do not partake of the box shape to the full extent shown by Short-horns.

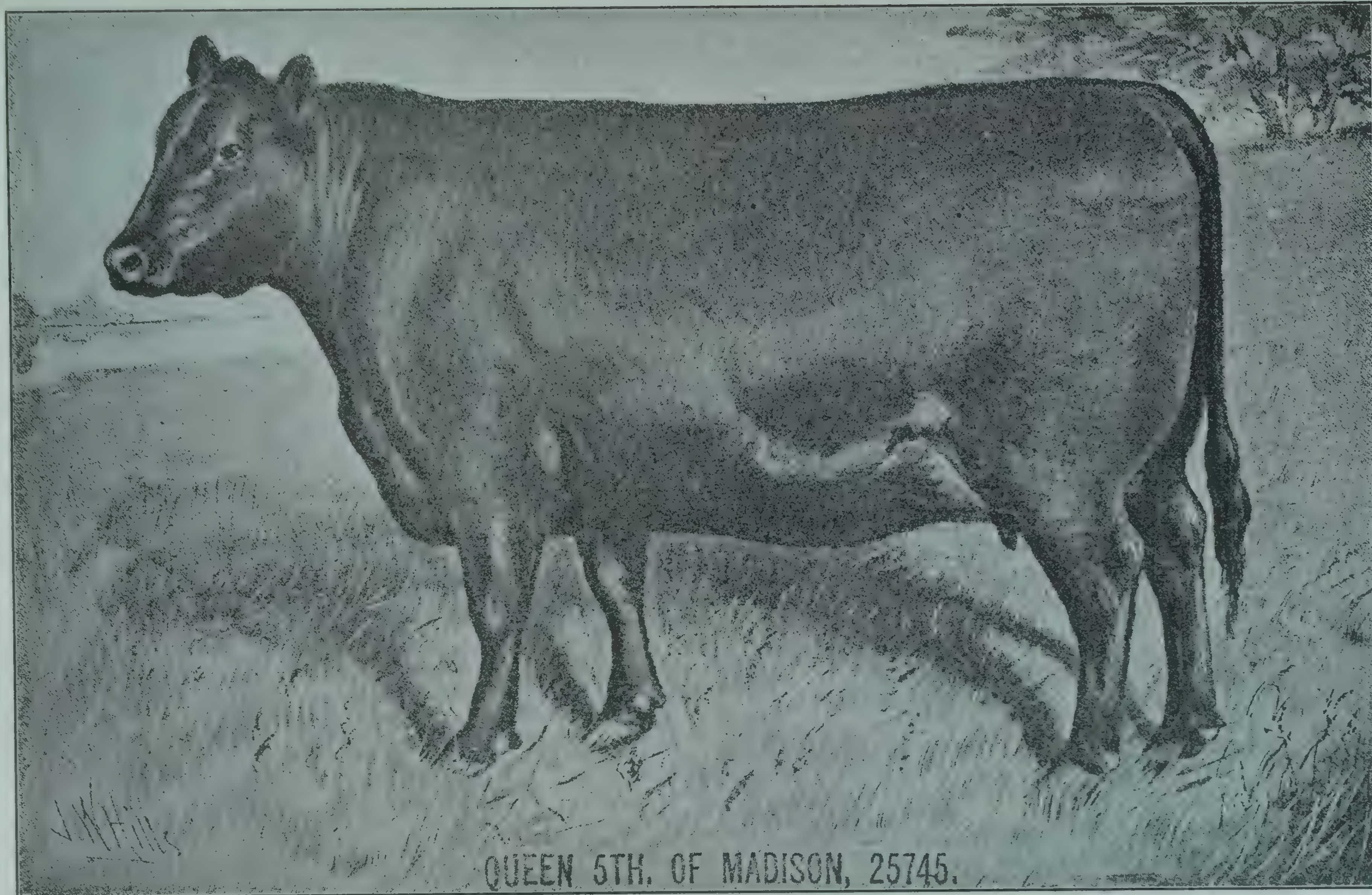


FIG. 20.—Aberdeen-Angus Cow.

FIG. 21.—Hereford Bull Java, 64045, the sire of more heifers selling for $800 or over than any other bull in America. Owned by C. A. Stannard, Emporia, Kan.

FIG. 22.—Hereford Cow Marietta 4th, 89311. Owned by C. A. Stannard, Emporia, Kan.

FIG. 23.—Hereford Cow Miss Leona, 94201. Owned by C. A. Stannard, Emporia, Kan.

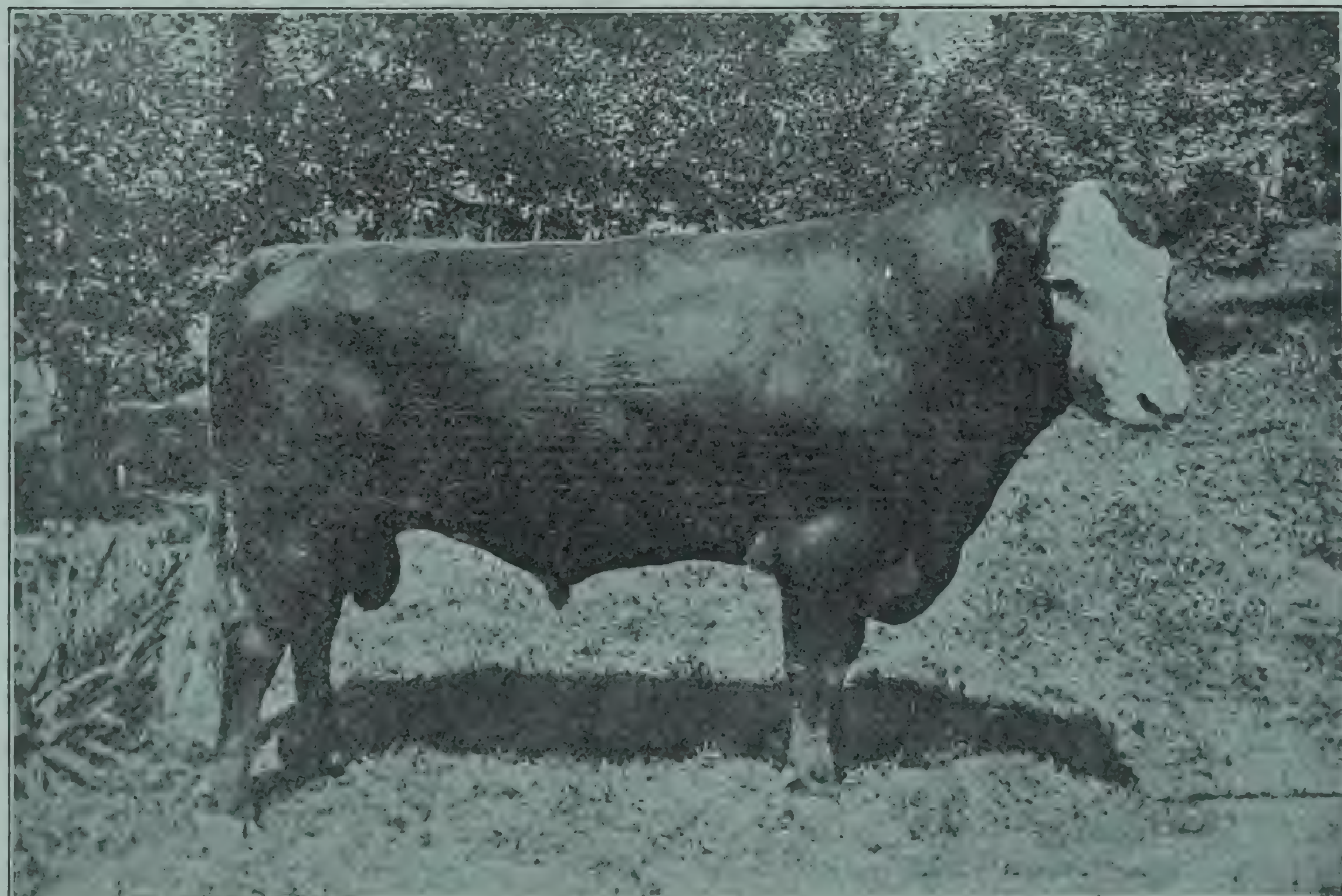


FIG. 24.—Polled Hereford Bull Bolivar. Bred by W. W. Guthrie, Atchison, Kan. (From Rommel, U. S. Dept. of Agriculture.)

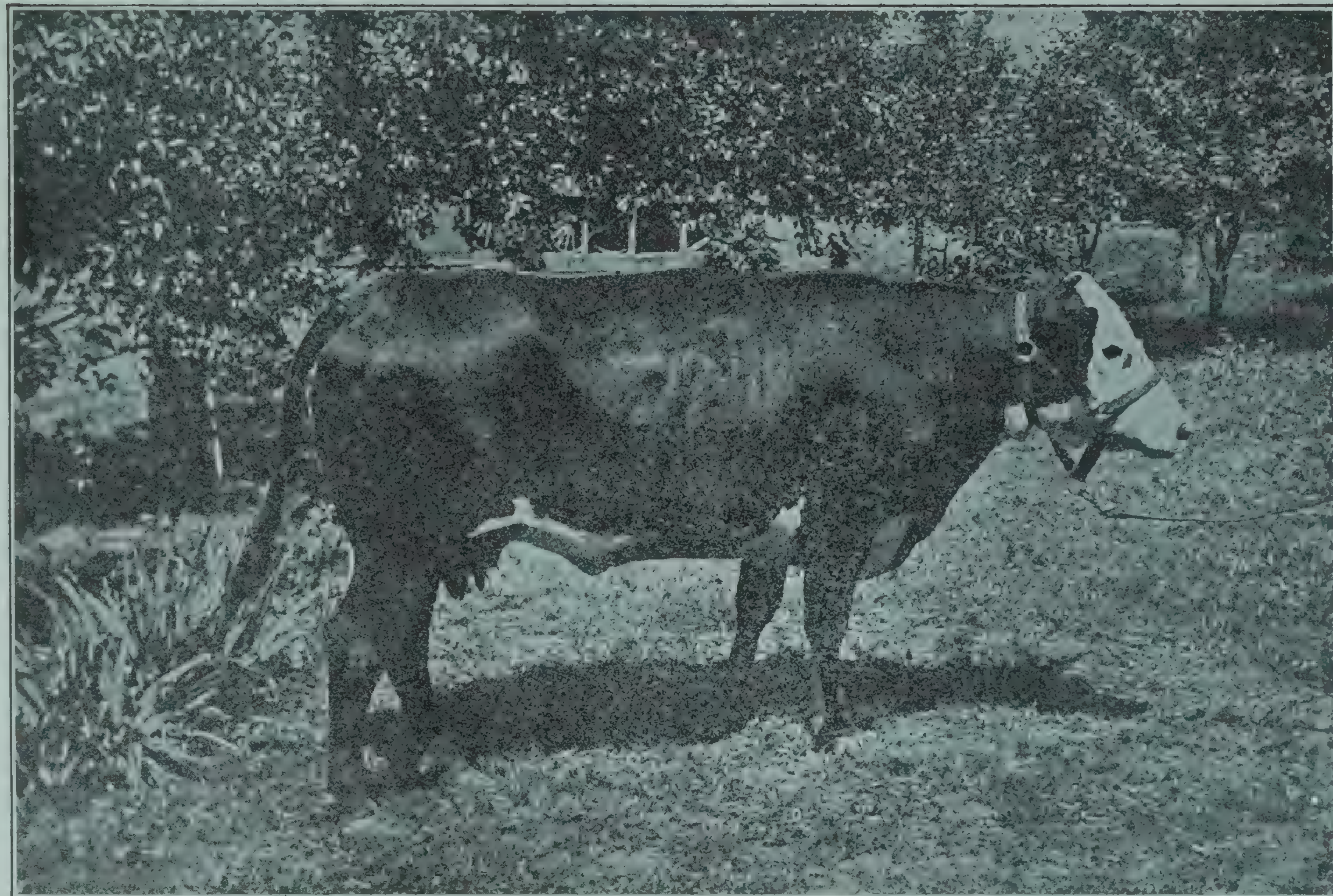


FIG. 25.—Polled Hereford Cow Bertha. Bred by W. W. Guthrie, Atchison, Kan. (From Rommel, U. S. Dept. of Agriculture.)

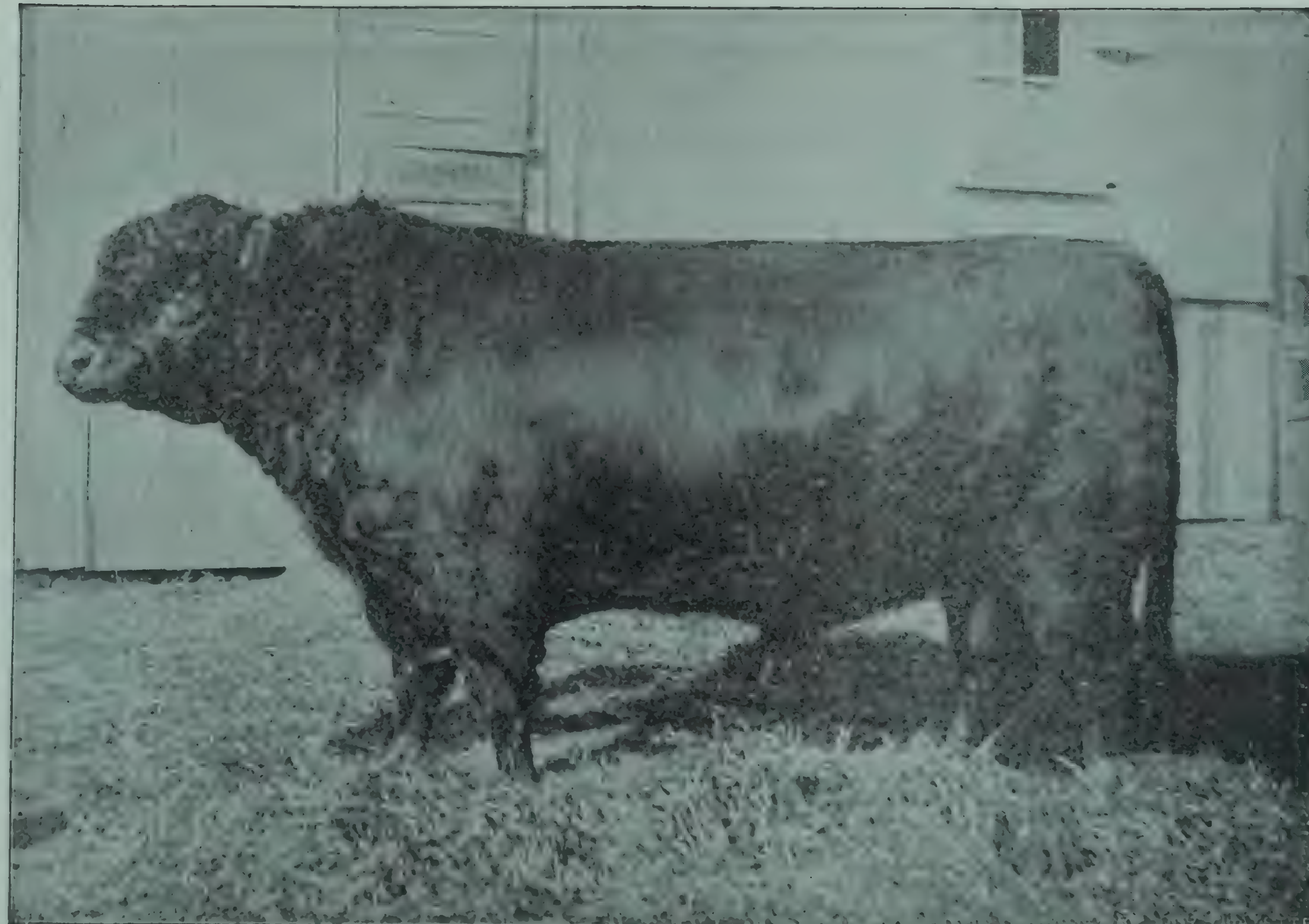


FIG. 26.—Imported Galloway Bull Druid of Castlemilk. Owned by O. H. Swigart, Champaign, Ill.

The head is short and broad and full of character, while the mouth and nostrils are large, showing vigor and digestive capacity. The horns are white or yellow, large, long and rather coarse. In the male they are only slightly curved and have a tendency to droop. In the female there is a tendency to curve upward.

The development of the fore quarters is strong, showing more brisket and dewlap than Short-horns, and the back and loin are extremely well covered with high-priced meat, but the hind quarters are sometimes not as wide as they should be, and older animals, when in high condition, are sometimes "patchy" or lumpy.

The buttock, when viewed from the side, is seen to be less straight than in the Short-horn, but yet not so bulging as in the Angus.

For crossing on grades and natives the Hereford is excellent, but Shaw, in his "Study of Breeds," says he does not cross so well with Devons. As

FIG. 27.—Galloway Heifer Lutie Lake.
(From Rommel, U. S. Dept. of Agriculture.)

grazers the Herefords are superior to either Short-horns or Polled Angus. They seem to excel the other breeds on the dry, short pastures on the Western ranges, but are also able to put on flesh rapidly when put on good pasture.

As feeders they are probably not much different from the Short-horns and Angus, all of them being excellent. Compared with Short-horns, they are probably superior as grazers and in the quality of the meat, but they give less milk and are sometimes unduly heavy in brisket and dewlap and light in thighs.

POLLED HEREFORDS.

These cattle are, of course, the same in color and similar in conformation to the standard or horned Herefords. However, they seem to depart a little more from the standard Hereford characteristics than do the Polled Durhams from the Short-horns; in so far as the dual-purpose idea has, to a considerable extent, been allowed to influence their breeding and selection by the originator of the variety, Gen. W. W. Guthrie, Atchison, Kansas, who, in speaking of their origin, says: "The progenitor of this breed was a freak of nature, calved in a Chase County, Kansas, herd in March, 1889, the product of a Hereford-Short-horn cow and a thoroughbred Hereford bull. This animal had the Hereford colors and the Short-horn shape, and a well-formed, polled (not simply muley) head, a long body, good loin, and well-developed hind quarters."

It seems that by starting with this polled Hereford-Short-horn bull and breeding him to standard Hereford and Short-horn cows, carefully selecting the progeny and persisting in this breeding for five or six generations, the type and hornless feature have been pretty well fixed.

More recently some attempt has been made to breed Polled Herefords by gathering up those hornless "sports" or "freaks," which occasionally appear in the standard or registered Hereford herds.

A Polled Hereford Club and Register have been established with Warren Gammon, Des Moines, Ia., as Secretary.

The breed now has representatives in seven States—Kansas, Texas, Illinois, Wisconsin, Iowa, Nebraska and West Virginia.

GALLOWAYS.

This is one of the oldest and purest of the improved breeds of cattle. It is a Scotch product and was not imported to this country until about 1870. It ranks fourth in popularity among the special beef breeds, and its hardihood and rustling qualities would seem to fit it admirably for the western and higher portions of this State.

Like the Aberdeen-Angus, it is a hornless black breed, but a brown tinge to the coat is quite usual, while the hair is long, soft and wavy with a thick mossy undercoat that renders the hides suitable for robes. The wiry or curly coats sometimes seen are very objectionable.

In general appearance they are low set, sturdy and active, with excellent feet and legs. Compared with the Angus, which they resemble quite closely, they are somewhat smaller and rougher. The hips, pin bones, tail head and shoulders are more prominent, making them rather deficient at the crops and less round and symmetrical. The head is shorter and broader at the poll, while the ears are larger and more inclined to droop. In hardihood and grazing qualities they are superior to either Short-horns or Aberdeen-Angus, but probably, as a result, lose somewhat in feeding qualities.

The quality of the meat is unsurpassed, while their prepotency is remarkable. Crossed on natives, or the horned pure breeds, a large percentage of the progeny will be black and nearly all of them hornless.

DUAL-PURPOSE BREEDS.

There is still a large number of farmers who believe that it is possible to combine beef and milk-producing qualities to an extent that renders such an animal the most profitable for the average farm. Such cattle are called general-purpose, or, according to the more modern term, dual-purpose animals. In this class Short-horns must be considered as taking high rank, but the tendency of Short-horn breeding during recent years has been so decidedly toward special beef qualities that we have thought best to consider them in the class of special beef breeds. This leaves but two breeds which we deem it necessary to consider under the head of the dual-purpose breeds. These are Red Polled and Devon.

RED POLLED.

The breed originated in the counties of Suffolk and Norfolk, England, and was first imported to this country in 1873. Since then their popularity has increased quite rapidly, until to-day they are probably the most popular of the dual-purpose breeds in this country, as their good qualities would seem to justify.

FIG. 28.—Imported Red Polled Bull Wild Boy. Owned by V. T. Hills, Delaware, O.

As the name indicates, Red Polls are hornless and of a deep red color; no stubs of horns, or scurs, are admissable, but a white switch is occasionally and white on the udder frequently seen and not particularly objectionable.

In size they are less than Short-horns and greater than Devons, being about midway between the two breeds. They are in general conformation somewhat between the beef and dairy types. However, while rather fine and lack-

ing the massive appearance of the beef breeds, they are still compactly built and moderately round and smooth. The lack of uniformity in conformation, which is a natural result of the dual functions of milk and beef production, is often seen and to that extent lessens their usefulness as a beef breed.

Their grazing qualities are rather above the average, as we should expect from their smaller size, compact build and active, but gentle, disposition. As feeders they are probably not equal to either Short-horns, Herefords or Angus. Their crossing qualities are of the best, 80 to 90 per cent of the progeny being red and nearly all of them hornless, no matter whether crossed on natives or the improved horned breeds.

Compared with the beef breeds they are, for beef production, inferior in

FIG. 29. - Red Polled Cow Sultana 2d. Owned by V. T. Hills, Delaware, O.

size, feeding qualities and uniformity of beef type, but as dual-purpose cattle they seem to unite the two antagonistic functions of beef and milk production to an extent equalled by no other breed.

DEVONS.

This is a popular breed of cattle in this State, especially where the care and pastures are not of the best and a fair amount of milk and beef is desired.

It is the oldest of the English pure breeds and was brought to this country as early as 1817, but on the whole it can not be said that they have ever become very popular. Their small size and lack of high-class beef conforma-

FIG. 30. – Devon Bull Tulips Royal 1st, 6875. (From Rommel, U. S. Dept. of Agriculture.)

tion and the absence of pronounced milking qualities always being against them. In size they are less than any of the beef breeds, and also something less than the Red Polls.

Their color is deep red, no white being admissible except on the udder.

In general conformation they lack the straight, even lines and box-shaped massive form of the beef breeds, partaking considerably of the dairy type, and yet not to a degree which prevents them from making a fair amount of beef of an excellent quality. They dress a large carcass in proportion to live weight, but the percentage of the higher priced to the cheaper cuts is not so great as in the breeds possessing a more pronounced beef type.

FIG. 31. Devon Cow Caroline, 10805.
Owned by Dr. J. Cheston Morris, Fernbank Farm, West Chester, Pa.

Their strong points of merit are their grazing and rustling qualities, which account for their popularity in this State where that attention, feed and specialization necessary to produce the highest quality of beef cattle are not common. They cross well on the native stock and produce a good quality of meat when well fattened.

While the Devon is not equal to the purely beef breeds when the care and feed are supplied necessary for the production of cattle that will "top the market" and yield the best profits; yet, with those who can not, or will not, take the trouble to prepare good pastures and furnish the best care and feed they are extremely valuable, and for many years to come will continue to best suit the conditions on a large number of North Carolina farms.

SPECIAL *vs.* DUAL-PURPOSE BREEDS.

When beef production is the chief consideration it is not so much a question of which breed as of the correct type or form. In all the breeds described in the foregoing pages first-class beef-producing animals are to be found; likewise inferior animals, unprofitable feeders, in short, scrubs, are also found in all of them. What is most important is to select the breed and individual animals that will give the largest percentage of high-class beef cattle in their progeny. In this respect there is not much difference in the best types of Short-horns, Herefords and Angus, but all of these possess considerable advantage over the dual-purpose breeds in the uniformly high-class beef qualities of their progeny. A large number of people still believe in the dual-purpose idea, and we are frequently asked to name the best breed for both beef and milk. That the so-called dual-purpose breeds will in many instances produce an average quantity of milk of average quality, and be capable of making profitable beef, we do not think any well-informed man will deny; nor will he deny that individuals of those breeds may be capable of making average beef and also yield profitable returns in the dairy. Moreover, individuals of those breeds occasionally possess the highest qualities in either beef or dairy lines, but such excellence is not possessed by the same individual in both lines. In other words, while the dual-purpose does exist in breeds, it does not exist to a high degree in individuals. As they excel in one they lose in the other, so, as a breed, only average qualities are attained.

If the farmer aspires to only average success, average cattle, average profits, in short, to be only an average man, then, by all means, let him select one of the dual-purpose breeds, but in this day and age an average man is of very little force in any sphere of life. The successful man is one who beats the average, and to do so in beef production he must not be handicapped with an average steer, nor with a breed that does not produce the largest percentage of high-class beef cattle in its progeny. The question arises, why are the highest dairy and beef qualities incompatible in individuals? Because those qualities in their highest development are the result of an inheritance of entirely different types of conformation and habit.

The beef animal has been bred to retain the product of the food consumed in his body as flesh and fat, while the dairy animal is bred to throw it off from the body in the form of milk, only retaining enough for the bare needs of the animal economy. These functions are so essentially different, if not antagonistic, that necessarily the types are entirely distinct. The divergence in form becomes apparent at a glance at typical specimens of the two classes of animals. The beef type calls for a massive head and a short, thick neck, while the dairy form shows a delicate, clean-cut head and slender neck. The former presents shoulders and withers that are broad and flat, while the latter has thin shoulders and is sharp at the withers. The lower line of the beef type is straight with the flanks very full and thick, while in the dairy cow the straight lower line is absent and the flank is especially thin and "cut up" to a marked degree. The same contrast is noticeable in the hips and loins. In the one is the thickly-fleshed loin and broad smooth hips, while in the other the same parts are lean and angular. The degree of difference in the opposing types is still further accentuated in the thighs. Those of the

beef animal are thick from side to side, and so well fleshed that the posterior line is straight or only slightly curved from root of tail to hock. In the dairy cow the thighs are thin to give place for a large udder, and the absence of any surplus flesh gives a decidedly concave posterior line. The reader is referred to figures 3, 4, 5, 6, 8, 9, 10, 11, 12, 13 and 14, which clearly show these divergent types.

The habits of certain farmers and the conditions on many farms, still supply a useful field for the dual-purpose breeds, but such habits and conditions are usually unfortunate and undesirable.

The same ideas concerning general-purpose horses once existed, and, to some extent, still exist in certain sections. This line of thought and breeding filled the country with scrubs fit for no special purpose and, hence, unsalable, except at prices below the cost of production. Just so with cattle breeding, this dual-purpose idea means medium or second-class cattle not abreast of the progress of the times and not able to meet the competition of the special breeds. It means that the South will continue to breed cattle that will sell for four cents while the Northwestern farmer will breed the special beef breeds and market them at from twenty-five to fifty per cent higher prices.

Let us now look a little deeper into this matter and see if the investigators have shown wherein and why the beef-bred steer is superior to natives and dairy-bred animals for beef production.

The first point that would naturally suggest itself would be that he would make more pounds of gain on a given amount of food.

To the surprise of many, this is probably not so to a marked degree. When Sanborn announced the result of an experiment in which the Ozark scrub made as many pounds of gain on a given amount of food as the well-bred beef steer, many were incredulous, but subsequent experiments at the Michigan, Iowa, Ontario, Kansas, Missouri and other Experiment Stations have confirmed the statement that the scrub, or dairy-bred steer, will make a pound of gain on as little food, or as cheaply, as the beef-bred steer. The average for the three beef breeds, Hereford, Short-horn and Angus, in the experiments referred to above, was 724 pounds of food for 100 pounds of gain, while the average for the Holsteins, Jerseys and others was 722 pounds of food for 100 pounds of gain.* It is true that these experiments are not complete nor conclusive. They have not taken the animals from birth, which is a very great defect. Moreover, the fact that the beef breeds at an average age of 995 days weighed an average of 1,506 pounds, while the non-beef breeds at an average of 1,008 days only weighed 1,359 pounds, at least suggests more rapid growth and possibly at some period of life a more economical use of food. However, it is quite certain that the improved beef breeds have no such marked superiority over the scrub in this respect, as many have believed.

EARLY MATURITY.

We must look further, then, for the reason of the beef steer's greater value and consequent popularity. Early maturity at once suggests itself, but while it is an important quality, the difference between our beef and dairy breeds is not very great, although the advantage in this respect possessed by the im-

* From data given in Henry's "Feeds and Feeding."

proved beef breeds over the native, or scrub, is very marked. We have already seen that the beef steers reached a considerably higher weight at three years old than the scrubs and dairy-bred steers, and although weight alone does not constitute maturity, it is a fact that the beef steer does mature earlier; that is, becomes fit to produce prime beef at a younger age than the scrub; but this quality is not by any means the chief cause of his popularity with packers, butchers and feeders.

DRESSED CARCASS.

To find wherein the beef steer excels the dairy-bred steer, we must go to the dressed carcass. Here we find a marked difference sufficient to sustain all the claims made by those who advocate the beef breeds for beef. In fact, the buyers know the superiority of the beef-bred steer's carcass so well that of eighteen steers tested by the Iowa Experiment Station, the average price for Herefords, Short-horns and Angus, at Chicago, was $6.458 per hundred live weight, while the average price of the Holsteins and Jerseys was $4.75 per hundred pounds live weight. This is a difference of $1.708 per hundred pounds live weight, or about 36 per cent in favor of the beef breeds.*

This is a distinct and decided advantage for the beef steer, and it will be interesting, as well as instructive, to inquire into the reasons why the buyers made this difference.

These reasons may be briefly stated as follows: First, the proportion of dressed carcass, or meat, to gross or live weight, is from five to ten per cent greater in the beef-bred steer than in the scrub, and the amount of loose tallow and suet is much less; second, when the dressed carcass is cut up by the butcher there is in the carcass of the beef-bred steer a much larger percentage of valuable or high-priced meat than in the carcass of the scrub.

The difference in the proportion of dressed carcass to live weight may be stated thus: A beef-bred steer weighing 1,000 pounds would give a dressed carcass of about 650 pounds, while a scrub steer of the same live weight, nc matter how well fattened, would give a dressed carcass of only 550 pounds. Right here, then, is a difference of 100 pounds of dressed meat between the two steers weighing 1,000 pounds each. A comparison of the amount of loose tallow and suet in their carcasses would show a like superiority in the beef-bred steer. In the Short-horns, Herefords and Angus above referred to the loose tallow averaged 13.2 per cent of the dressed weight, while in the Holsteins and Jerseys it averaged 18.35 per cent. In fact, the Hereford steer weighing 1,022 pounds, only had 129 pounds of loose tallow, while the Jersey steer weighing 880 pounds, or 142 pounds less, had 165 pounds of loose tallow. In other words, the Jerseys weighed 142 pounds less, but had 36 pounds more loose tallow.* Tallow is cheaper than lean meat, hence the superiority of the beef-bred steer.

In speaking of a test made between a dairy and beef-bred steer at the Iowa Experiment Station, Professor Curtis says:

"When these cattle went to market the Hereford commanded a price ten cents in advance of the highest quotations of any other cattle. He was one of a car load to command that price. His selling represented a premium of ten cents amoung 1,700 cattle. Both of these steers sold on their actual merits.

*From data given in Henry's "Feeds and Feeding."

The other steer went on the same market, and was obliged to sell $2.125 below the top quotations, a difference of $2.225; or, in other words, the Hereford brought exactly 49 per cent more than the Jersey.

"When they were slaughtered the Hereford steer dressed 67.5 per cent, and the Jersey dressed 57.5 per cent; in other words, there was ten per cent more net beef in the Hereford. I will say further, that the Jersey was as well finished as it was possible to make it; no amount of feeding could have made him any better for beef purposes than he was at the time he went to market. Both steers were in good form.

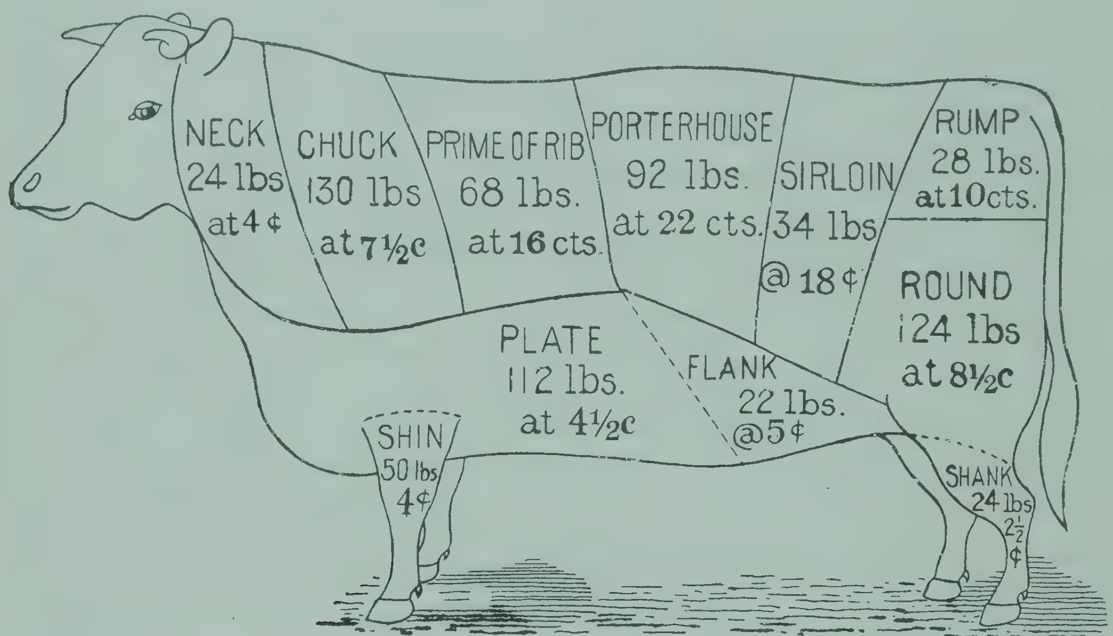


FIG. 32.—The carcass of a well-fattened grade steer as cut up by the Chicago butchers, giving retail price per pound for the different cuts.

"In addition to the ten per cent more beef in one of them, when the slaughter test was made, the Jersey contained 190 pounds of loose fat; and, in addition to that 55 pounds of suet, and the carcass dressed 763 pounds. The Hereford had a carcass that weighed over one hundred pounds more, or 888 pounds. He was well finished, and in that carcass we only found 90 pounds of tallow, as against 190 in the other, and 38 pounds suet as against 55. Talow, at that time, was worth four cents a pound at wholesale, while choice steak was worth nineteen cents.

"Now, while these steers were rendering equal returns for a bushel of corn consumed in the feed lot, while they were charging the feeder the same price for a pound of beef, in the market one of them commanded 49 per cent more than the other, and this applied to the entire carcass.

"Now, you can readily see why the buyer put that difference on these animals. It is their business to know—and they do know—what an animal will cut out on the block; but when the feeder does not recognize that difference he is obliged to bear the loss. These steers were both good representatives of their respective type and breed, and while the Jersey had that large quantity of internal tallow, he had not the development and finish in the high-priced cuts that the Hereford had. He had fat deposited around his internal organs to the extent of one-third his entire weight, while there was not meat enough

on his ribs and back to decently cover his bones. The buyers object to that class of cattle; for, while they are finished, in the sense of being fattened, they are not finished in the parts that produce the high-priced beef."

Figure 32 shows the manner in which a carcass is cut up by the retail butchers of Chicago, and the prices indicated for each cut are about right for moderately high-priced cattle.

A good 1200-pound steer makes a carcass about like that represented, and if we put in one class all those cuts that sell for over eight cents per pound and into another all those selling for less than eight cents, we have the following:

HIGH-PRICED CUTS.

Name of Section.	Weight of Cut.	Price per Pound, cts.	Total Value.
Prime of rib	68	16	$10 88
Porterhouse	92	22	20.24
Sirloin	34	18	6.12
Rump	28	10	2.80
Round	124	8.5	10.54
Total	346		50.58

LOW-PRICED CUTS.

Name of Section.	Weight of Cut.	Price per Pound, cts.	Total Value.
Neck	24	4	$0.96
Plate	112	4.5	4.04
Flank	22	5	1.10
Chuck	130	7.5	9.75
Shin	50	4	2.00
Shank	24	3	.72
Total	362		18.57

The food consumed by this steer in making the 346 pounds that sold for $50.58 was no greater than that required to produce the same weight of meat, like the 362 pounds that sold for $18.57; but the type of the beef-bred steer enables him to produce a higher percentage of these high-priced cuts.

Prof. F. B. Mumford, in a pamphlet on "Factors in Profitable Beef Production," gives us the following data on this point:

Name of Breed.	Weight of all Cuts.	Weight of Porterhouse and Sirloin.	Per cent Porterhouse and Sirloin to all Cuts.
Shorthorn	1,046	127	12.1
Hereford	1,007	109	10.7
Angus	980	109	11.11
Scrub steer	824	82	9.1

Commenting on these figures the *Chicago Drovers' Journal* says:

"The table is valuable in that it shows something of the comparative difference between porterhouse and sirloin steaks cut from the pure bred and the scrub. We take these as given out from the Missouri Station, based on experiments there. The relative positions of the pure-bred or high-grade animals would possibly be reversed under another test, *but the scrub's position would always be just where he is now.* The pure bred has an advantage of forty-five pounds of porterhouse and sirloin over the scrub, which means an added value, at a good fair price of 21 cents a pound, of $9.45. It must be taken into consideration that these prices are for *two cuts only*, and that there must exist a similar proportion between the other cuts throughout the

steer, though the difference must necessarily be of less money value, since the cuts are worth less.

"The farmer must carry in mind that these are supposedly typical animals, and because the scrub steer is dubbed "scrub" it is merely because he is of inferior breeding and not from ill-health or deformity. *We know of no better or quicker method of improving the money-making capabilities of the herd than by the careful and judicious use of a pure-bred sire of good type and quality.*"

FORMATION OF THE HERD.

When the chief object is the production of beef, one of the special beef breeds should be selected. There is no good reason why a desire for a small quantity of good milk, such as would be given by two or three dairy cows, that may also be kept without inconvenience, should be allowed to reduce the quality of the whole beef herd to the level of mediocrity, or even to a slight degree below the highest excellence obtainable. But the question of which beef breed is to be selected is one of minor importance, which may well be determined by local conditions and individual preferences. In short, if a man has a fancy for anyone of the breeds, there is no reason why he should not gratify that fancy. However, the conditions under which the cattle are to be kept should be considered in selecting the breed. The question most frequently asked by farmers of this State when discussing the merits of the different breeds is, "Are they good rustlers?" In the true sense the highest and best type of beef animal is never a good "rustler." Rustling and the highest beef production are incompatible. They are even more directly antagonistic than beef and dairy qualities. The business of the beef steer is to convert large quantities of grass, hay, grain, etc., into large quantities of good beef, and at this he is an expert, but when asked to do anything else, for instance, travel long distances for a scanty food supply, or to live on "wind and water," he is at work for which he is not fitted, and consequently is a failure. He has not been bred for that purpose and his great size, early maturity and special beef type have not been attained under such conditions. The business of the beef steer is to be fat, and if he is not, the reflection is not on his breed, but upon his owner. Therefore, if for any reason abundance of food can not, or will not, be supplied, then, one of the dual-purpose breeds, because of their smaller size and better rustling or grazing qualities, will probably do better; and if this plan of cattle-raising is to be carried still further and the food supply and care reduced to scrub conditions, then, probably the scrub will do as well as any, for, as previously stated, rustling qualities are not beef qualities. This erroneous idea concerning the value of rustling qualities in live stock and the inclination to depend upon nature, which has done much for us, to do still more, is costing the State of North Carolina millions of dollars annually.

However, while the question of which beef breed is a minor consideration to be determined by local conditions and personal fancy, yet, the selection of good individuals of the breed chosen is of the greatest importance. Animals possessing the beef type in a high degree and from ancestors of the same high character of form should be selected. It is not deemed necessary to discuss the nature and value of pedigree in this article, but it may be briefly

stated that the man who engages in the breeding of pure-blood animals and does not take the trouble to familiarize himself with those individuals of the breed that have become noted because of their outstanding merits, is placing a very great handicap upon his chances for success. Pure-bred animals of good individuality and pedigree can not be obtained, at present, for anything short of what seem very high prices to the average North Carolina farmer; but if he will bear in mind that the average price received for all the cattle of the pure-beef breeds sold at auction during the last year is not far from $200, he will not expect to get first-class animals for less than is obtained for average animals.

It is unfortunately true that, as a rule, men are prone to engage in cattle-breeding when the business is booming and quit it at the first period of depression. This is always disastrous, for it means high buying prices and low selling prices. The business is one which requires years to reap the best profits, hence, no man can afford to pay high prices for foundation stock unless he makes the business a permanent one. There are two plans upon which herds of beef cattle will be established. A few desire to raise pure-bred animals to sell for breeding purposes. This line of breeding, when thoroughly understood, properly managed and advertised, is probably the most profitable, but few Southern farmers have had that education and training in live-stock husbandry and are sufficiently imbued with the idea that it is a great and complex business, requiring the whole personal attention and ability of the owner to make it a success. Such breeding requires a considerable sum of money and ample facilities for furnishing the best of care and food in abundance; but even the man whose main object is the production of beef can well afford to breed a few pure-bred animals. If the science and art of breeding is not all wrong and the work of the last century useless, the pure-bred animal is superior for beef if he must be used as such; but there is always a chance to sell a few of the best to the neighbors for breeding purposes at something above beef prices. Therefore, if able to do so, the start may be made with a bull and two cows of pure blood and the balance of the herd of the best grade or native cows, carefully selected as to beef type, that are available.

Selection of the Bull.—It is not economy to buy a cheap or inferior bull. We are frequently told that he is half the herd and, therefore, entitled to proportionate consideration; but when used on native or grade cows he is very much more than half the herd. He not only has a half interest in the parentage of all the calves, but when used on native or grade cows, by his stronger breeding, he also gives more than half their qualities to those calves. Therefore, if eight native cows are to be purchased at a cost of $200, an equal amount may legitimately and wisely be put into the purchase of a bull, even if he is only to be bred to those eight cows. Likewise, if $350 is to be spent in the purchase of ten good grade cows, it is only fair and wise to spend an equal amount for a bull to breed to them. But a bull, according to the manner in which he is handled, may serve from 25 to 100 cows each season; therefore, it becomes apparent that there is no economy in purchasing a cheap bull. Under no condition or consideration should any other than a pure-bred registered bull be used. No grade bull, no matter what his indi-

vidual form or excellence may be, is fit to use as a sire. An individually inferior pure-bred bull is infinitely better than the best grade when used for crossing on grade or native cows. The progeny of each is much more likely to be an average of his immediate ancestors than the counterpart of himself, therefore, the pure-bred bull, although himself inferior, will, through his stronger breeding, or the superior qualities of his ancestors, produce much the better lot of calves.

In brief, the bull selected should be a pure-blood of one of the special beef breeds, and should have the breed characteristics well defined. He should have a robust and vigorous constitution and possess great masculinity, but not coarseness, and above all, should be of the accepted beef type in the highest degree possible.

When the cost of a good pure-bred bull seems beyond the reach of any one man, good results usually follow a neighborhood combination for his purchase. There is no manner of doubt that a good bull is always a good investment for any section. If he sires during his entire life a total of 200 calves, they have only to exceed the scrub calf an average of $1.00 in value at marketing time to pay the purchase-price of the bull at $200. The difference in value between the half-blood and the scrub is, of course, several times that amount.

Management of the Bull.—Under strictly range conditions, or when the pastures are large, or the cattle not constantly under the eye of the owner or an attendant, it becomes necessary to allow the bull to run with the cows; but these conditions do not exist on most North Carolina farms, and should exist on less. Nevertheless, the bull is usually allowed to run with the cows under the erroneous belief that it is the cheapest and best method of keeping him. When advocating that the bull be kept separate from the cows, we are frequently met with the statement, "I can't afford to keep him up." We have no hesitation in stating that if any man, under ordinary farm conditions, can not afford to keep the bull separate from the cows he can not afford to keep him at all, for, beyond doubt, the most expensive and troublesome method of keeping a bull is to allow him to run with the herd. The advantages of keeping him separated from the herd are many and important. Some of these are that he is not so likely to break out and become hard to control and he is always within reach; he may be much more easily kept in good condition, owing to less worry and excitement, which is important; the date of breeding and calving can be known and controlled; he is less likely to do injury to himself or to others; he will do four times as much service and get more, stronger and better calves. If given a lot large enough to insure sufficient exercise and afford some grazing the direct cost will not be greater than he is at all times entitled to and should receive.

Shade for summer and shelter in winter are always necessary. When used he should either be handled by a staff attached to a ring in his nose, or allowed to pass quietly into a small pen adjoining his quarters, into which the cow has been driven. After one good service the cow and bull should be separated, the cow removed and the bull returned to his quarters. The ring should always be put into his nose while young, and although he should always be thoroughly under control, his treatment should be of the kindest. More bulls are made vicious by abuse than are controlled or corrected by it,

or than are naturally bad. If through lack of exercise, or other causes, his feet become long or out of shape, they should be properly trimmed.

Selection of the Cows.—While the selection of the cows for the beef herd is an important matter, still, an occasional mistake may be made in selecting

FIG. 33.—Young Beef Animals from Native Cows Crossed with a Pure-bred Sire. (From Soule, U. S. Dept. of Agriculture.)

a cow without the serious consequences that would follow a similar mistake in selecting the bull. When pure-bred cows are desired, a thorough knowledge of breed characteristics and pedigrees is necessary for the best results, but whether pure-bred, grade or native cows are to be used, the beef type, or form, is of the first importance. Those who are now gathering herds of grade or native cows upon which to use pure-bred bulls of the special beef breeds can not afford to ignore the advantages of the beef form in those cows, no matter how cheaply they must be purchased or how few in number. It will not be difficult to select a herd, even of native cows, that for the purposes in view will be worth double another herd of equal numbers taken without regard to beef type or form. If care be taken to select cows of this type, a

bull of any of the special beef breeds when bred to them will get a large percentage of excellent feeders capable of making high-class beef. When such a herd of cows has been carefully gathered, the quality and number of the herd may be rapidly increased by saving the grade heifers and breeding them to a bull of the same breed as their sire.

In this connection too much emphasis can not be laid upon the necessity of persisting in the same breed started with. Nothing is more absurd from the standpoint of scientific or practical breeding than the crossing of the breeds, if persisted in. It is not only fatal to all improvement, but certainly means loss of quality in any kind of a herd.

It is inexplicable, yet a fact, that a large number of people possess the insane idea that crossing the breeds brings improvement. Nothing could be more ridiculous or false. The man who uses a Devon bull for two or three years, then, perhaps, a Short-horn for a year or two, and next a Holstein, or a Jersey, as has frequently been done in this State, is certain to own a nondescript herd of all and variegated colors, of all shapes and misshapes, and of no quality.

The conditions under which cattle must be kept in this State are so varied that it is possibly not worth an attempt to lay down set rules for the management of the cows of the beef herd, but it may be put down as entirely probable that unless they receive good care and liberal feeding the profits will not be large, and it is equally certain that the greater and better the care and the more liberal and judicious the feeding, the greater the net profits.

SELECTION OF STOCKERS AND FEEDERS.

The selection of stockers and feeders deserves more attention than it receives from the few in this State who buy such cattle for grazing and feeding. The writer has seen many bunches of cattle picked up wherever they could be found, apparently without regard to their form or fitness for making beef, from which one-half might have been excluded and the net profits as the result of the feeding undoubtedly increased.

By reference to a preceding section of this article we find an instance where two steers while producing a pound of gain at practically the same cost, still showed a difference of $2.27½ per hundred pounds live weight, or 49 per cent, in their selling price. If any of us were going to sell a few tons of hay, or a hundred bushels of corn and heard of a buyer who would give 49 per cent more than we could get on the regular market, we would not fail to spend considerable time, if necessary, to find the fellow who offered the higher price. Why not take as much trouble in selecting the cattle to eat our grass, hay and grain? They can only be regarded as a convenient and profitable way of marketing the more bulky products of the farm, therefore we should see to it that we send our hay and grain to the best market—feed it to the best steer. It is quite possible to select feeders so as to have a bunch of cattle that when finished will sell from one to two cents a pound more than the average shipped from this State, which means a difference of from $10 to $20 on each 1,000-pound steer. This means a very considerable difference in the price we will receive for the hay and grain fed them.

All are familiar with the fact that flesh covers many faults in cattle, espe-

cially in the eyes of the inexperienced, yet a good judge is able to pick out with considerable accuracy the cattle that will feed best and make the best beef, no matter what their state of flesh may be. However, in the opinion of the writer, buyers are more frequently deceived in the beef-making qualities of cattle when real thin in flesh than when in fairly good condition. The average seller, if he has a lot of cattle thin in flesh and of poor quality, is al-

FIG. 35.—An Aberdeen-Angus Steer.
(By courtesy of Thos. McFarlane, Secretary American Aberdeen-Angus Breeders' Association.)

ways ready with the old but deceptive story, "These cattle are poor, and are now seen at their worst; when put on feed tremendous gain will be made; they will fill out on the hips, and the huge paunches will contract, the backs will become straight, the legs shorten, the ribs will soon be covered with thick flesh, the hair will become smooth and glossy, and the transformation will be so complete, and the objectionable points disappear so rapidly under the influence of food and care, as to make the cattle in a short time as fine a lot of feeders as can be found in the country."

This seemingly plausible argument deceives many, but is nonsense just

the same. No matter how poor cattle may be, if they lack the characteristics of beef animals—"the straight back and well-sprung ribs, the straight lower line and well-filled quarters"—they can never have their conformation changed by any quantity of food, or by any sort of care. In fact, the scrub or dairy-bred steer, as he increases in age, departs still farther from the proper beef form. His shoulders and belly grow larger, while his back, hips and thighs seem to get thinner. He is increasing in weight to be sure, but it is in portions furnishing the cheaper cuts and in tallow on his inside, and not in valuable beef over his back, loin and hips, or in his thighs. No matter what he may weigh, or how fat he may be made, he will still be a cheap scrub and bring a scrub price on the market.

The old saw, that an article well bought is half sold, is nowhere better illustrated than in the buying of cattle for feeding for beef. The question of profit or loss in the operation is much more dependent upon the judgment exercised in buying than upon any other feature of the whole business. If the cattle are properly bought, a good fair price for the feed consumed and the labor expended will almost always be obtained, but with careless buying the business is frequently a losing one, notwithstanding the advantage of cheap foods—cotton-seed products—with which we are favored.

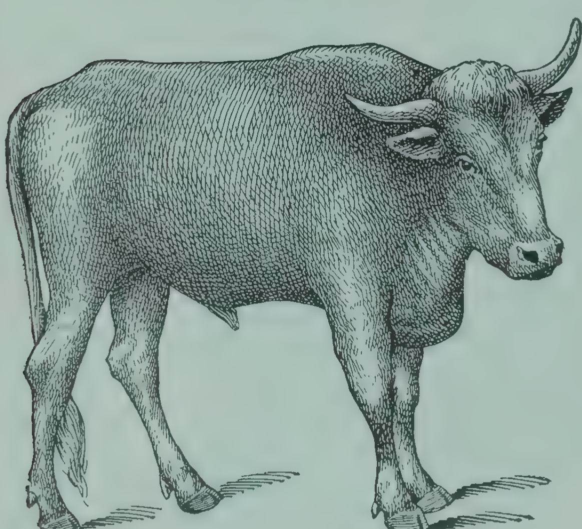


FIG. 36.—An Unprofitable Feeder.
(From Soule, U. S. Dept. of Agriculture.)

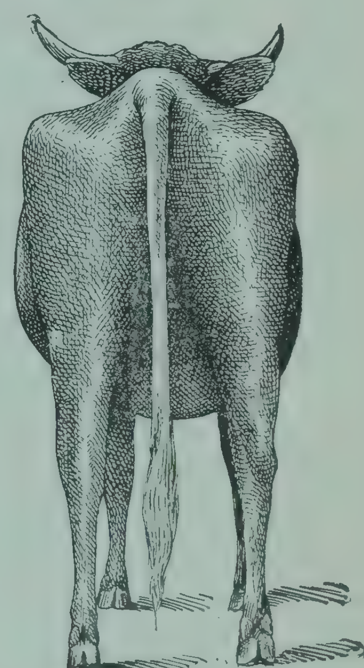


FIG. 37.—A Native Steer.
(From Soule, U. S. Dept. of Agr.)

The points essential to a good feeder are: A deep, wide, compact body, with straight back and under line and set on short legs; long, wide and smooth hindquarters accompanied by well-sprung ribs, giving a deep round barrel and even side lines; smooth, even shoulders, broad and level on top, and not developed in excess of hindquarters; a short, broad head with large mouth and massive, thickly fleshed lower jaws, and attached to a short full neck.

Those characters, somewhat indefinitely described as "quality," and indicated by moderately fine hard bone, soft elastic hide and a fine silky coat are desirable, but what are known as good handling qualities are even more im-

portant as an index of good feeding prospects. These are an elastic skin of medium thickness, rather loosely covering even mellow flesh. This, of course, is influenced very considerably by the condition of flesh and care; still, an amimal with a hard skin tightly drawn over his bones is not likely to make a very profitable feeder. Other characters to be avoided in the feeder are: A long, narrow head, a slim neck, long coarse legs, with large rough joints, light flanks, small heart girth, rough open shoulders and coarse, harsh hair.

It is not expected that an animal thin in flesh will present the same even surfaces and straight lines of the animal in better flesh, but the general form and frame should be such that flesh rather evenly laid on will produce the smooth plump form essential to good beef making.

It may also be stated that a young animal in fair flesh and of a quiet or mild disposition is always more desirable than a real thin, wild or nervous old one. Of course, when first put on to full feed, the thinner and older animals may make more rapid gains, but these are usually obtained at a greater expense for food and will not be maintained for very long periods.

THE CATTLE TICK AN OBSTACLE TO THE DEVELOPMENT OF THE CATTLE INDUSTRY.

The greatest obstacle to the development of the cattle industry of North Carolina is the cattle tick (Boophilus bovis), which carries the contagion of the disease known by the following names, throughout this State: Texas fever, tick fever, splenic fever, distemper, red water, bloody murrain, acclimation fever, town-cow disease, etc.

Very frequently, as these names indicate, the owners little suspect the true nature of the disease, many of them being under the impression that their cattle died of some new or mysterious disease, when, in reality, they suffered from the well-known trouble, tick fever; but the cattle, perhaps, died and were buried, or hauled away, before the ticks became large enough to be noticed; for while the disease will develop in susceptible cattle within ten days after the ticks get on them, still, these same ticks do not become sufficiently large to be readily noticed until they have been on the cattle from two to three weeks.

In North Carolina probably more cattle die from this one disease than from all others combined. The reason for this is that even in that portion of the State below the Federal quarantine line, all of which is supposed to be infected. not more than one-fourth the farms are infested with this fever-producing tick. The cattle on the other or tick-free farms, which, as stated, are three times as numerous as the infected farms, are, of course, just as susceptible to the disease as those raised in New York or Minnesota. This means that all cattle traffic between these tick-free and tick-infested farms must be stopped or heavy losses are certain to result. Many people disregard these facts, either through ignorance of the entire question, or incredulity as to the disease conveying powers of the ticks; hence, the large losses which occur, amounting to thousands upon thousands of dollars annually.

Probably the most heavy losers are those who buy cattle during the winter

or early spring to run on their pastures during the summer. Old pastures are quite likely to be infested and those having such tick-infested pastures can not safely buy up cattle to put upon them unless they are careful to secure immune cattle. These can be picked out with a fair degree of accuracy by the scars or pits produced by the ticks during the preceding summer, but the best way to deal with the question is to exterminate the ticks in such pastures. Then cattle may be safely taken from any farm during the months of January or February. Until the tick is entirely exterminated serious losses are certain to occur and the cattle traffic interfered with to an extent which precludes the best development of the cattle industry of the State.

The quarantine restrictions now necessarily placed upon the Southern States by the Federal Government, in order to protect the cattle of other States from this fatal tick fever are causing a loss of not less than $5.00 a head on every animal marketed in or from this State. Another great disadvantage resulting from the presence of the cattle ticks is the obstacle which they offer to the introduction of improved or pure-bred stock from the Northern States. A great many more of our farmers would be willing to pay $200 for a good bull if they did not have to run a great risk of him dying soon after reaching the State. Even if not more than 50 per cent. died from this disease it would then make a $200 bull cost the North Carolina farmer not far short of $450 when the chances of death and transportation charges are considered.

Under present conditions cattle may be brought into that portion of the State below the quarantine line, or all that part of the State east of the Blue Ridge, with safety, only in some one of the following ways: First, if the farm is free of ticks he may be brought to it during January or February with comparative safety. If brought in summer he should not be unloaded from the cars into the regular cattle pens, and must be hauled from the depot in a wagon, or be thoroughly greased over the legs and under parts of the body and led home in the center of the road where he will not come in contact with grass or weeds, and then thoroughly greased again after reaching the farm.

Second, he may be taken to a tick-infested farm if, before his arrival, suitable quarters are prepared and the same precautions as above specified be observed in his transfer from the railway car to the farm. The quarters necessary to prepare on a tick-infested farm are as follows: Build a shed and yard in a field cultivated the year before and upon which no ticky cattle could possibly have been. Build a double fence around the lot, the outer being at least six feet distant from the inner. Arrange a pen just outside the outer fence into which the bull may be taken for service without crossing any ground except that within his double-fenced lot. Clean each cow of ticks and thoroughly grease her before admitting her to the breeding pen, and when served remove her at once and return the bull to his quarters within the inner fence.

Third, cattle may be taken to a tick-infested farm, with only small loss, after artificial inoculation with the blood of a Southern animal that has become thoroughly immune as indicated by tick infestation the previous summer. This inoculation gives the cattle a mild attack of the fever, which, after recovery, enables them to withstand a mild tick infestation. This in-

oculation may be done in the North before shipment or after reaching this State. It should be done when the cattle are about a year old and during the winter. By this method not more than 10 per cent are lost and with special care the loss may possibly be reduced to 5 per cent.

To encourage the importation of pure-bred stock the State Department of Agriculture will inoculate all animals brought to the State free of all charges, except for actual feed and care during the time necessary to complete the procedure. Those desiring inoculation done by the Department should write the State Veterinarian and arrange to ship their stock direct to Raleigh during December and January.

Fourth, those having tick-infested farms, who do not deem it practicable to clean them of ticks, should, in the opinion of the writer, import nothing older than three months of age. If calves of this age are brought South in the spring they acquire an immunity during the first summer in the same way as the native calves and the loss is slight. All calves are born immune, but they gradually lose that natural immunity by the time they are grown. If, however, while they are losing that natural immunity, they get a few ticks on them, they gradually acquire an artificial immunity, such as is done by all native immune cattle.

Fifth, the best plan of dealing with the question is to exterminate the tick on the farm and keep it free. This may be easily and quickly done, as we shall readily understand if we bear in mind the following facts concerning the cattle tick (Boophilus bovis):

1. The female tick, when large and full of blood, drops off the cow to the ground.

2. After two or three days she begins laying eggs and lays from 1,500 to 2,500 during the next two weeks.

3. In three or more weeks these eggs hatch.

4. The young ticks (seed ticks) crawl on to the grass, weeds and twigs and wait for cattle to come along, for as long as three or four months.

5. The young ticks after attaching themselves to cattle remain there for about four weeks, when, having become grown and full of blood, the females drop off and begin laying eggs again.

6. Ticks do not go from one animal to another.

7. If the young ticks do not get on to cattle (or horses) inside of four or five months they die.

8. Neither old nor young ticks crawl far and a fence with a rail or board on the ground will almost certainly stop them, but wire fences do not always afford protection.

9. Eggs laid late in the fall when there is not sufficient warmth to hatch them will go through the winter and hatch out in the spring.

10. Young ticks probably do not live through the winter in this climate.

With these facts in mind several methods for the extermination of the ticks readily present themselves.

First, keep all cattle and horses out of the pastures infested with ticks for one year, and the ticks must surely die. Of course, it follows without saying that the cattle must also be excluded from the same lots and lanes or roads used by the tick-infested cattle last year.

Second, if it is not practicable to entirely change the pasture, it is frequently possible to reduce the number of cattle kept and divide the pasture, allowing the cattle to run on half this year and the other half next year. This as certainly and effectually starves the ticks to death.

Third, where the number of cattle is small and sufficient care exercised they may be run on the tick-infested pastures and still the ticks exterminated in one year. Feed along with the salt given, at least one part of sulphur to every three parts of salt. Take kerosene and any other cheap grease—half and half—and thoroughly grease the cattle once a week during the summer. This will prevent the ticks getting on the cattle and kill those already on. The under parts of the body up one-third the way on the sides and the legs only should be greased. If any ticks happen to get on the other parts of the body the weekly handling is almost certain to bring them to view, when they may be picked off and burned. Half-grown female ticks will lay eggs that will hatch, therefore all ticks taken off the cattle should be burned. Of course, thorough work is necessary to make this plan successful.

If any of these three plans be put into effect not later than September 1st the ticks will be exterminated before the next spring.

BREEDERS AND REGISTRY ORGANIZATIONS.

American Short-horn Breeders' Association, John W. Groves, Secretary, Springfield, Ill.

American Aberdeen-Angus Breeders' Association, Thomas McFarlane, Secretary, 17 Exchange Ave., Chicago, Ill.

American Hereford Cattle Breeders' Association, C. R. Thomas, Secretary, Exchange Ave., Union Stock Yards, Chicago, Ill.

American Galloway Breeders' Association, Frank B. Hearne, Secretary, Independence, Mo.

Red Polled Cattle Club of America (incorporated), J. McLain Smith, Secretary, Dayton, Ohio.

American Devon Cattle Club, L. P. Sisson, Secretary, Newark, Ohio.

American Polled Durham Breeders' Association, Fletcher S. Hines. Secretary, Indianapolis, Indiana.

American Polled Hereford Cattle Club, Warren Gammon, Secretary, Des Moines, Ia.

HOW TO MARK CATTLE FOR THE IDENTIFICATION OF INDIVIDUALS.

The following system of marking cattle is that used by the American Aberdeen-Angus Breeders' Association, Thos. McFarlane, Secretary, Harvey, Ill.:

"Cattle uniform in color and without horns need permanent and ready means of identification. The use of ear tags, marked halters, tattooing, branding of body or hoofs, etc., have not proved permanent or entirely satisfactory. Notching the ears of a young animal *marks it for life*. The hair grows over the markings, but the marks remain and can be readily distinguished. The objections to this method are not serious when compared with

the advantages resulting from *certain* identification of the animal. Such ear marks can be duplicated upon certificates of registry and thus pass from owner to owner, as a constant means of identification. As in this system, the

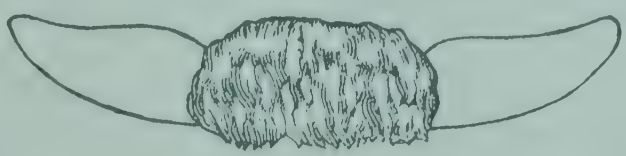


FIG 38.—Showing Form of Stamp for Marking Book.

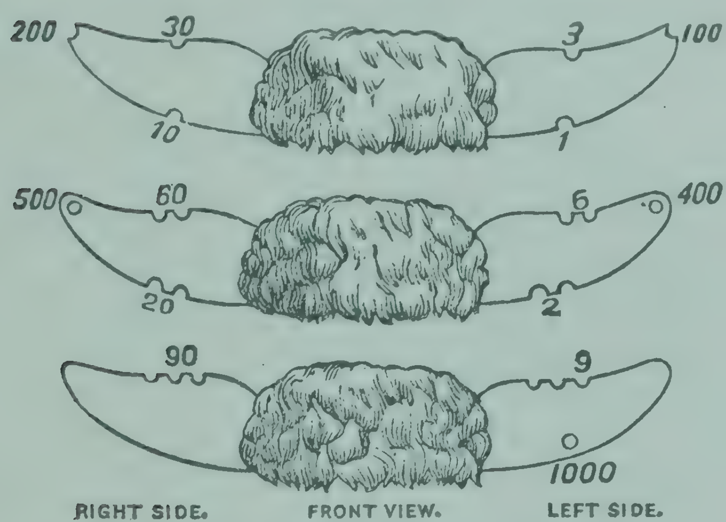


FIG. 39.—Showing Ears Marked.

marks in case of error can not be rubbed out, care is required to secure accuracy. The operator requires a rubber stamp (50 cents) as per cut above and inking pad (20 cents), both of which can be had through the Secretary. With these he can stamp first a series of impressions of the head and ears upon the pages of a record book, and also upon a sheet of paper, notching and numbering the impression in the book just as he proposes to notch the ears of the animals to be marked, making the impression and marks also on the sheet of paper to correspond—then *with this duplicate sheet in hand when doing the work* he can be sure to mark the animals *exactly* as shown in his record book."

EXPLANATION OF THE VALUE OF THE VARIOUS NOTCHES.

A notch in *bottom of left* ear equals 1, two notches equal 2.

A notch in *top of left* ear equals 3, two notches equal 6, three notches equal 9.

A notch in *bottom of right* ear equals 10, two notches equal 20.

A notch in *top of right* ear equals 30, two notches equal 60, three notches equal 90.

A notch in *end of left* ear equals 100.

A notch in *end of right* ear equals 200.

A hole in *end of left* ear equals 400.

A hole in *end of right* ear equals 500.

A hole in *bottom of left* ear equals 1,000.

Numbers can thus be made from 1 to 1,000. In the absence of a special punch Dana's "*cattle* ear tag punch" can be used (which can be had from C. H. Dana, West Lebanon, N. H.), cutting sideways (of the punch), a U-shaped notch, 5-16 of an inch deep by 3-16 of an inch wide.

EXAMPLE.—Notches made as follows represent 217:

1 notch in bottom of left ear equals	1
2 notches in top of left ear equal	6
1 notch in bottom of right ear equals	10
1 notch in end of right ear equals	200
Total equals	217

INDUSTRIAL STATISTICS, 1902.

For some years past the August *Bulletin* has been devoted to the industrial progress of the State. Necessarily the matter must be tabulated in order to list as many industries as possible in the limited space of a single *Bulletin*. For some reason great reluctance is encountered in securing accurate statements of the milling, manufacturing and other industries of the several counties, and while extraordinary pains were taken to secure accurate information, much has been omitted which should be recorded and thus swell the volume of business done in the State. As many as four applications were sent to some counties, and yet the lists are not filled nor the capacity reported. It is especially to be regretted that certain centers of industry refused to answer any of the requests sent out. Hence it must be stated that while these omissions are apparent, the lists are as complete as it is possible to secure through the volunteer correspondence. In this connection the Commissioner desires to thank the corps of correspondents, both the regular crop correspondents and the special reporters who have aided in gathering information presented in this *Bulletin*. Their services are much appreciated by the Department and by the people of the State who are interested in the reports printed from time to time.

LIST OF COTTON MILLS REPORTED TO THE DEPARTMENT OF AGRICULTURE.

Name of Mill.	Post-office.	No. Spindles	No. Looms.	Annual Capacity—Pounds or Yards.
Alamance County—				
Holt Granite Manufacturing Co	Haw River	17,760	863	1,500,000 pounds.
Aurora Mills	Burlington	16,608	748	
Elmira Mills	do	5,000	463	1,000,000 pounds.
Windsor Mills	do	3,120	150	500,000 pounds.
Lakeside Mills	do	3,300	150	
The E. M. Holt Plaid Mills	do		140	300,000 pounds.
Glenco Mills	do	3,744	200	2,340,000 pounds.
Carolina Mills	do	3,072	58	
Juanita Mills	do	6,200		
Alamance Mills	do	960	94	
Daisy Hosiery Mills	do	34 machines		
Burlington Hosiery Mills	do	28 machines		
Oneida Mills	do	11,248	587	
Oberon Mills	do			
Belmont Mills	do	2,512	195	
Travora Mfg Co	do	3,600		740,000 yards.
Sidney Mills	do		150	
Voorhees Manufacturing Co	do		82	200,000 pounds.
Altamahaw Mills	Elon College	5,500	324	
Ossipee Mills	do	4,000	342	
Saxapahaw Mills	Saxapahaw	4,704	100	
Virginia Mills	Swepsonville	10,000	300	
Dixon Manufacturing Co	Snow Camp	756	17	
Alexander County—				
Moore Mills	Liledoun	2,000	96	1,440,000 yards.
Little River Mills	Taylorsville	800	24	300,000 yards.
Anson County—				
Wadesboro Mills	Wadesboro	6,704		780,000 pounds.
Eldorado Cotton Mills	Ansonville	4,000		
Hargrave & Leak Mfg. Co	Wadesboro			
Buncombe County—				
Asheville Mills	Asheville	8,550	450	1,800,000 pounds.
Wm. Whittham Textile Co	do		200	
Burke County—				
Alpine Cotton Mills	Morganton	11,000		3,000,000 pounds.
Waldensin Hosiery Mills	Valdese	29 machines		
Valdese Hosiery Mills	do	37 machines		
Beaufort County—				
Washington Knitting Mill	Washington	27 machines		41,600 dozen.
Cabarrus County—				
Cannon Manufacturing Co	Concord	23,536	906	13,590,000 yards.
Cabarrus Mills	do	8,500	542	2,500,000 pounds.
Odell Manufacturing Co	do	32,000	1,750	24,000,000 pounds.
Lippard Yarn Mills	do	2,000		250,000 pounds.
Baia Mills	do	3,000		
Coleman Manufacturing Co	do	5,200	140	
Gibson Manufacturing Co	do	1,500	350	2,000,000 pounds.
Patterson Manufacturing Co	do			
Bleachery Mills	do			
Kindley Mills	Mt. Pleasant	4,000		300,000 pounds.
Tuscarora Mills	do	2,888		
Caldwell County—				
Gwyn-Harper Mfg. Co	Patterson	1,800	40	
Granite Falls Mfg. Co	Granite Falls	3,000		750,000 pounds.
Lenoir Mills	Lenoir	6,000		
The Rhodhiss Mfg. Co	Rhodhiss	15,000	440	
Catawba County—				
Newton Mills	Newton	7,500		
Newton Knitting Mills	do	180 machines		
Catawba Mills	do	3,000		
Newton Hose Mill	do			
E. L. Shuford Mfg. Co	Hickory	7,765	200	
Monbo Mills	Monbo	3,248		600,000 pounds.
Maiden Mills	Maiden	4,000		
Union Mills	do	10,000		8,000,000 pounds.
Providence Mills	do	5,000		
Long Island Mills	do	3,000		
E. L. Shuford Mfg. Co	Brockford			
Chatham County—				
J. M. Odell Manufacturing Co	Bynum	6,000		600,000 pounds.
Siler City Mills	Siler City			
Hadley-Peoples Mfg. Co	do	2,100		

COTTON MILLS—Continued.

Name of Mill.	Post-office.	No. Spindles	No. Looms.	Annual Capacity—Pounds or Yards.
Chowan County—				
Edenton Cotton Mills	Edenton	6,272		600,000 pounds.
Cleveland County—				
Cleveland Mills No. 1	Cleveland Mills			
Cleveland Mills No. 2	Lawndale	5,200		2,125,984 pounds.
Double Shoals Mills	Double Shoals	3,200		750,000 pounds.
Belmont Mills	Shelby	3,850		
Laurel Glen Mills	do			
Shelby Mills	do	6,600	250	3,900,000 yards.
Buffalo Mills	Stubbs	3,100		282,960 pounds.
Enterprise Mills	Kings Mountain	2,650	130	300,000 pounds.
Bonnie Mills	do	5,160		
Williams Knitting Mills	do			
Waco Knitting Mills	Waco	27 mach	ines	30,000 pairs.
Burton Mill	Shelby	3,100		
Shelby Knitting Mills	do	23 mach	ines	
Craven County—				
Claremont Mills	New Bern			
Southern Hoisery Mills Co	do	191 mac	hines	
Cumberland County—				
Holt-Williamson Mfg. Co	Fayetteville	5,000		700,000 pounds.
Holt-Morgan Mills	do	10,000	300	
Tolar, Hart & Holt Mills	do	10,944		1,000,000 pounds.
Fayetteville Mills	do			
Lafayette Mills	do	40 mach	ines	
Hope Mills Mfg. Co	Hope Mills	13,000	750	
Beaver Creek and Bluff Mills	do			
Cumberland Mills	Cumberland	3,000		
Manchester Mills	Manchester	2,700		
Davidson County—				
Wennoah Mills	Lexington	11,976	453	2,184,000 pounds.
Nokomis Mills	do	12,000	320	900,000 pounds.
Davie County—				
Cooleemee Mills	Cooleemee	25,000	800	
Durham County—				
Durham Mfg. Co	Durham	23,500	692	
Edgemont Cotton Mills	do			
Pearl Mills	do	10,336	210	
Commonwealth Mfg. Co	do	7,000		1,500,000 pounds.
Golden Belt Mfg. Co	do	24,416	640	7,500,000 pounds.
Durham Hosiery Mills	do	12,000 mules.	375 mach's	1,878,000 yards. 117,375 dz. stoc'gs.
Erwin Mfg. Co	West Durham	25,088	926	5,750,000 pounds.
Willard Mfg. Co	Willardsville	1,800		360,000 pounds.
Edgecombe County—				
Tarboro Cotton Factory	Tarboro	13,000	200	5,000 bales.
Fountain Mills	do	5,300		940,000 pounds.
Riverview Knitting Mills	do			
Tarboro Mills, No. 1	do			
Tarboro Mills, No. 2	do			
Runneymede Hosiery Mills	do	120 mac	hines	175,000 pounds.
Forsyth County—				
Arista Mills	Winston-Salem	5,184	200	3,220,235 yards.
Southside Mfg. Co	do	10,752	168	1,300,000 pounds.
Twin City Knitting Mills	do	26 mach	ines	
Winston Knitting Mills	do	26 mach	ines	
Davis-Crews Knitting Mills	do	28 mach	ines	
The Greenfield Hosiery Mill	Kernersville	24 mach	ines	72,000 dozen.
Victor Hosiery Mills	do	12 mach	ines	
Shamrock Knitting Mills	Winston-Salem	243 mach	ines	
L. A. Vaughn	do	40 mach	ines	
Franklin County—				
Sterling Mills	Franklinton	6,240		2,000,000 pounds.
Laurel Mills	Laurel	680		
Gaston County—				
Stanly Creek Mills	Stanly Creek	5,000		
Tuckaseegee Mills	Mt. Holly	4,992		1,080,000 pounds.
McAden Mills	McAdensville	15,000	350	
Cherryville Mills	Cherryville	6,656	192	
Spencer Mountain Mills	Lowell	4,368		909,000 pounds.
Lowell Mills	do	5,120		
Trenton Mills	Gastonia	6,400		620,000 pounds.
Gastonia Mfg. Co	do	9,500	136	1,000,000 pounds.
Avon Mills	do	10,000	300	800,000 pounds.
Ozark Mills	do	9,000		100,000 pounds.
Modena Mills	do	9,000	208	1,300,000 pounds.

COTTON MILLS—Continued

Name of Mill.	Post-office.	No. Spindles	No. Looms.	Annual Capacity—Pounds or Yards.
Gaston County—Continued.				
Arlington Mills	Gastonia	6,272		
Loray Mills	do	25,000	820	5,200,000 pounds.
Southern Mills	Bessemer City	9,320	401	
Bessemer City Cotton Mills	do	9,200	224	Madras goods.
Mims Manufacturing Co	Mt. Holly	3,000		700,000 pounds.
Albion Mills	do	2,250		
Mountain Island Mills	Mountain Isl'd	6,250	104	
Dallas Mills	Dallas	4,160	116	
Catawba Electric Power Co	Mountain Isl'd			
Vivian Mills	Cherryville	1,632		600,000 pounds.
Gaston Manufacturing Co	do			
Mt. Holly Mills	Mt. Holly	1,986		
High Shoals Manufacturing Co	High Shoals	5,000	174	
Chronicle Cotton Mills	Belmont	5,000		
Lula Cotton Mills	Kings Mount'n	5,000		
Cora Cotton Mills	do	5,284		1,440,000 pounds.
Dillings' Mills	do	11,136	552	1,200,000 pounds.
Crowder's Mount'n Cotton Mill	do	3,500	123	
Kings Mountain Mfg. Co	do	4,992	130	900,000 pounds.
Harden Manufacturing Co	Harden	2,080		288,000 pounds.
Granville County—				
Oxford Mills	Oxford	6,120		
Guilford County—				
Revolution Mills	Revolution	14,000	376	2,500,000 pounds.
Huckomuga Mills	Greensboro		144	360,000 pounds.
Oakdale Mills	Jamestown	5,300		1,500,000 pounds.
Hiawatha Manufacturing Co	Gibsonville	3,744		
Mt. Pleasant Manufacturing Co	Kimesville	2,000	101	374,663 pounds.
Proximity Manufacturing Co	Greensboro	18,000	1,005	15,000,000 yards.
Minneola Mills	Gibsonville	2,000	200	700,000 yards.
Halifax County—				
Roanoke Mills Co., No. 1	Roanoke Rapids	14,336	560	1,637,147 pounds.
Roanoke Mills Co., No. 2	do	2,300	105 mac	hines.
United Industrial Co				
Weldon Manufacturing Co	Weldon	2,016	21 knitte	ers. 300,000 lbs. cott.
Scotland Neck Mills	Scotland Neck	110 mac	hines.	
Rosemary Manufacturing Co	Roanoke Rapids	6,000	200	750,000 pounds.
Littleton Hosiery Mills	Littleton	56 mach	ines.	50,000 dozen.
Crescent Hosiery Co	Scotland Neck	103 mach	ines.	
E. Shields	do	30 mach	ines.	
Henderson County—				
Hart Manufacturing Co	Flat Rock	75 mach	ines.	
Hendersonville Knitting Mills	Hendersonville			
Hertford County—				
Winton Knitting Mills	Winton	18 mach	ines.	
Iredell County—				
Statesville Mills	Statesville	10,000	180	
Mooresville Mills	Mooresville	8,736	181	1,000,000 pounds.
Turnersburg Mills	Turnersburg	1,600		
Johnston County—				
Smithfield Mills	Smithfield	5,000		
Clayton Mills	Clayton	5,120		
Lenoir County—				
Kinston Cotton Mills	Kinston	10,250		
Orion Knitting Mills	do	110 mac	hines.	
Lincoln County—				
Laboratory Mills	Lincolnton	5,025		416,000 pounds.
Lincoln Mills	do	7,000		
Elm Grove Mills	do	6,600		
Willow Brook Mills	do			
Indian Creek Manufacturing Co	do	2,080		400,000 pounds.
Long Shoals Mills	Long Shoals	7,280		
Delma Mills	Lincolnton	2,000		
Daniel Manufacturing Co	do	8,000		
Dearmont Mills	do			
Rudisill Mills	do			
John Rudisill Mfg. Co	do	30 mach	ines.	
Mariposa Mills	Mariposa	2,500		
Indian Creek Knitting Mills	Dora	15 mach	ines.	
Mecklenburg County—				
Ada Mills	Charlotte	8,000		
Alpha Mills	do			
Highland Park Mfg. Co	do	7,000	468	
Atherton Mills	do	10,000		
Victor Mills	do	12,672		1,200,000 pounds.

COTTON MILLS—Continued.

Name of Mill.	Post-office.	No. Spindles	No. Looms.	Annual Capacity—Pounds or Yards.
Mecklenburg County—Continued.				
Magnolia Mills	Charlotte	3,100		
Louise Mills	do	20,000	525	
Crowley Manufacturing Co	do		225	
The O. A. Robins Co	do			
Charlotte Mills	do	10,000	248	1,000,000 pounds.
Orient Manufacturing Co	do	14,000	340	
Elizabeth Mills	do	6,000		500,000 pounds.
Barnhardt Manufacturing Co	do			
Chadwick Mills	do	12,000	300	
Charlotte Cordage Co	do	2,020	105bra'rs	1,040,000 pounds.
Dover Mills	Pineville	8,500	368	
Anchor Mills	Huntersville	4,100		
Cornelius Mills	Cornelius	5,300	200	
Linden Manufacturing Co	Davidson	5,824		480,000 pounds.
Virgin Mills	Huntersville			
Moore County—				
Sanford Mills	Sanford	9,000	300	
High Falls Manufacturing Co	High Falls	2,912		972 bales cotton.
Cameron Cotton Mills	Cameron	2,000		300,000 pounds.
Eugenia Manufacturing Co	Jonesboro	2,200		5,000,000 pounds.
Montgomery County—				
Smitherman Mills	Troy	3,328	100	1,500,000 yards.
Capelsie Mills	do	2,500		816,000 yards.
Yadkin Falls Mfg. Co	Milledgeville			
National Manufacturing Co	do			
Nash County—				
Rocky Mount Mills	Rocky Mount	26,000		2,311,390 pounds.
New Hanover County—				
Wilmington Mills	Wilmington	7,436	432	1,000,000 pounds.
Delgado Mills	do	10,300	424	
Orange County—				
Eno Mills	Hillsboro	10,000		1,200,000 pounds.
Alberta Mills	Chapel Hill	5,500		
Blanch Hosiery Mills	do	26 mach	ines.	
Pasquotank County—				
Elizabeth City Mills	Elizabeth City	10,000		850,000 pounds.
Elizabeth City Knitting Mills	do	120 mach	ines.	
Person County—				
Roxboro Cotton Mills	Roxboro	5,016		1,250,000 pounds.
Pitt County—				
Greenville Knitting Mills	Greenville	14 Knit. Frames	21 machines.	31,300 dozen.
Polk County—				
Tryon Hosiery Mills	Lynn	133 mac	hines.	
Randolph County—				
Randleman Manufacturing Co	Randleman	6,061	350	
Worth Manufacturing Co., No. 3	Worthville		102	360,000 pounds.
Plaidville Manufacturing Co	Randleman		198	
Marie Antoinette Mills	do			
Naomi Falls Manufacturing Co	do	6,000	335	2,500,000 pounds.
Randleman Hosiery Mills	do	68 mach	ines.	
Pearl Hosiery Mills	do			
Worth Manufacturing Co, No. 1	Worthville	5,852	224	
Enterprise Manufacturing Co	Coleridge	3,750		600,000 pounds.
Columbia Manufacturing Co	Ramseur	11,070	340	6,000,000 yards.
Randolph Manufacturing Co	Franklinville	4,000	128	1,680,000 yards.
Franklinville Manufactur'g Co	do	3,472	90	1,200,000 pounds.
Cedar Falls Manufacturing Co	Cedar Falls	3,936	136	663,224 pounds.
Worth Manufacturing Co., No. 2	Central Falls	4,256	154	1,040,000 pounds.
Richmond County—				
Roberdell Manufacturing Co	Rockingham	6,392	302	3,986,849 yards.
Pee Dee Mfg. Co., 1 and 2	do	12,784	603	2,350,534 pounds.
Steele's Mills	do	21,504	600	9,284,068 yards.
Great Falls Manufacturing Co	do	4,512	147	2,500,000 yards.
Midway Mills	do	6,000		
Ledbetter Manufacturing Co	do	2,512		480,000 pounds.
Textile Manufacturing Co	do		12	
Robeson County—				
Lumberton Cotton Mills	Lumberton	6,000		1,040,000 pounds.
Rockingham County—				
Edna Mills	Reidsville	25,300	552	1,700,000 pounds.
Leaksville Cotton Mills	Spray	3,136	624	8,000,000 yards.
Nantucket Mills	do	6,240	805	2,500,000 pounds.
Lilly Mills	do	2,496	303	1,500,000 pounds.
Spray Mills	do	24,000		

COTTON MILLS—Continued.

Name of Mill.	Post-office.	No. Spindles	No. Looms.	Annual Capacity—Pounds or Yards.
Rockingham County—Continued.				
Madison Mills	Madison			
Mayodan Mills	Mayodan	31,816		4,080,000 pounds.
Avalon Mills	do	13,128		1,785,000 pounds.
Rowan County—				
Salisbury Mills	Salisbury	20,000	590	200,000 pounds.
Vance Mills	do	10,000		900,000 pounds.
Kesler Manufacturing Co	do	11,232	226	3,400,000 yards.
Rowan Knitting Mills	do			
Littman Mill & Braiding W'ks	do			
Patterson Manufacturing Co	China Grove	9,296	158	1,522,872 yards.
Lynn Mills Co	do	3,500		
Salisbury Hosiery Mills	Salisbury		45 macs	60,000 dozen.
Rutherford County—				
The Henrietta Mills	Henrietta	75,000	1,876	11,400,000 pounds.
The Florence Mills	Forest City	15,000	400	3,600,000 pounds.
Levi Mills	Rutherfordton	6,240		33,800 pounds.
Caroleen Mills	do			
Cliffside Mills	Henrietta	10,000	200	
Scotland County—				
Scotland Mills	Laurinburg	10,000		
Richmond Mills	Laurel Hill	2,400		
Dickson Mills	Laurinburg	5,000		1,000,000 pounds.
Ida Mills	Elmore	4,160		700,000 pounds.
Springfield Mills	do	3,000		600,000 pounds.
Stanly County—				
Norwood Manufacturing Co	Norwood	8,128		600,000 pounds.
Wiscassett Mills	Albemarle	21,000		2,200,000 pounds.
Efird Manufacturing Co	do	10,000		
Windemere Knitting Mills	do	75 mach	ines.	
Surry County—				
Hamburg Mills	Mt. Airy	1,600		
Pine Hill Mills	do			
Hazlehurst Mills	Hazel	912		
Laurel Bluff Mills	Laurel Bluff	3,000		
Chatham Manufacturing Co	Elkin	10,000	300	
Elkin Manufacturing Co	do	2,000		
Union County—				
Monroe Cotton Mills	Monroe	8,320		800,000 pounds.
Rodman & Heath Cotton Mills	Waxhaw	5,000		
Vance County—				
Henderson Mills	Henderson	15,000	216	
Seaboard Knitting Mills	do	97 mach	ines.	
Harriett Mills	do	10,272		
Wake County—				
Pilot Mills	Raleigh	5,550	205	3,000,000 yards.
Raleigh Mills	do	14,496		1,700,000 pounds.
Caraleigh Mills	do	10,400	436	5,000,000 yards.
Melrose Knitting Mills	do	53 mach	ines.	
Neuse Mills	do	8,000	256	900,000 pounds.
Raleigh Hosiery Co	do	128 mac	hines.	
Royall Mills	Wake Forest	6,624	192	
Wayne County—				
Wayne Cotton Mills	Goldsboro	3,600	170	
Borden Manufacturing Co	do	6,000		
Wilson County—				
Wilson Cotton Mills	Wilson	6,080		1,000,000 pounds.

LIST OF WOOLEN MILLS

REPORTED TO THE DEPARTMENT OF AGRICULTURE.

Name of Mill.	Post-office.	No. Spindles.	No. Looms.	Annual Capacity—Pounds or Yards.
Leaksville Woolen Mills	Leaksville	1,300	40	3 sets cards.
Chatham Manufacturing Co	Elkin	5 sets	75	300,000 lbs. wool.
Reem's Creek Woolen Mills	Weaverville	210	5	
F. & H. Fries	Winston-Salem	3 sets	50	307,244 yards.
J.N. Emmitt	Fayetteville	1 set	cards.	
Richland Mills	Waynesville	260	6	
Northbrook Mills	Hull's X Roads	180	----------	
Willow Brook Mills	Lincolnton	240	4	
Alpine Mills	Hazel	500	22	
Southern Woolen Mills	Kernersville	288	5	30,000 yards.
Catawba Woolen Mills	Plateau	200	----------	12,150 lbs. yarn.
Southern Woolen Mills	Blackburn	240	1	4,000 lbs. wool.
VanDeventer Carpet Co	Greensboro	----------	80	
Samuel Young	Mooresboro	2 sets	cards.	
Gwyn-Harper Mfg. Co	Patterson	480	15	
Dixon Manufacturing Co	Snow Camp	700	18	

LIST OF SILK MILLS

REPORTED TO THE DEPARTMENT OF AGRICULTURE.

Name of Mill.	Post-office.	No. Spindles.	No. Looms.	Annual Capacity—Pounds or Yards.
Ashley & Bailey Co	Fayetteville	----------	125	
Patterson Textile Co	Roanoke Rapids	----------	80	500,000 yards.
Wadesboro Silk Mills	Wadesboro	15,000	----------	

MISCELLANEOUS MILLS.

Name of Mill.	Post-office.	Annual Output.
Alamance County—		
White Furniture Co	Mebane	$200,000.
Continental Chair Co	do	6,000 dozen.
Scott-Mebane Manufacturing Co	Graham	Overalls.
Juanita Grist Mills	Burlington	
George W. Anthony	do	Blind and Sash.
George W. Anthony	do	Broom and Handle.
F. T. Williamson & Co	do	Shirts.
Home Ice Refrigerator Co	do	
Burlington Coffin Co	do	
Alexander County—		
Alspaugh Roller Mills	Taylorsville	500,000 lbs. 12,000 bushels.
Taylorsville Flour Mills	do	15,600 barrels.
Campbell & Williams	do	Locust pins.
Ingram & Co	do	Sash, doors, etc.
Watts & Webster	Parte	Flour.
Bowman, Rink & Ekard	Polycarp	
Campbell & Williams	Vashti	
Hiddenite Roller Mills	Hiddenite	
Alleghany County—		
Hooker Furniture Co	Hooker	
Sparta Roller Mills	Sparta	
El Creek Roller Mills	El Creek	
Anson County—		
Anson Oil and Ice Co	Wadesboro	
H. D. Pinkston & Son	do	Vehicles.
D. L. Taylor & Son	do	Vehicles.
Brasington & Co	do	Brick.
Morven Milling and Ginning Co	Morven	
Pee Dee Hardware Manufacturing Co	McFarland	
John E. Efird	Goodman	
Goodman Tannery	Polkton	

MISCELLANEOUS—Continued.

Name of Mill.	Post-office.	Annual Output.
Ashe County—		
Creston Wagon Co	Creston	
Beaufort County—		
H. M. Cox, Saw Mill	Blounts Creek	
M. M. Hill, Gin and Saw Mill	Chocowinity	
J. A. H. Tankard, Gin and Grist Mill	Yeatesville	
W. H. Wilkinson, Saw Mill	Leechville	
Wm. Schuette, Saw Mill	Belhaven	
Surry-Parker Mill and Machine Shop	Pinetown	
Surry-Parker Tar and Chem. Works	do	
J. G. Hodges, Saw and Grist Mill	Minneola	
W. S. D. Eborn, Mill and Gin	Bunyon	200 bales.
C. H. Brooks Lumber Co	Bath	
A. N. Waters Shingle Co	Minneola	
J. B. Kellingsworth Gin and Mill Co	Beckwith	
Benj. Chauncey, Saw Mill	Surry	
J. S. Marsh, Cotton Gin	Bath	
T. R. Boyd, Cotton Gin	Edwards	
B. H. Thompson, Cotton Gin	Idalia	
Roanoke R. R. and Lumber Co	Bath	1,095,500 feet.
Freeman & Hodges Lumber Co	Washington	
Eureka Lumber Co	do	12,000,000 feet.
Sparks Manufacturing Co	do	2,000,000 barrels and boxes.
Kugler Lumber Co	do	
Havens Oil Co., Gin	do	2,000 bales.
Globe Shirt Factory	do	
W. B. Walling Lumber Co	do	
S. R. Fowle & Son Lumber Co	do	
E. M. Short Lumber Co	do	9,500,000 feet.
Crystal Ice Manufacturing Co	do	
John Havens, Grist Mill	do	350,000 bushels.
Moss Planing Mill	do	
Pamlico Iron Works	do	
Mutual Machine Works	do	
John R. Perry, Saw Mill	do	
Woollard Bros., Saw and Gin	do	
H. L. Hodges, Saw Mill	do	
R. C. Cherry, Saw Mill	do	
W. L. Hodges, Cotton Gin	do	
W. B. Rodman, Cotton Gin	do	
Washington Ginning Co	do	
Whitehurst Gin and Barrel Co	Aurora	
Springer Lumber Co	South Creek	5,000,000 feet.
Wade's Point Lumber Co	Winsteadville	
J. G. Winstead & Son, Gin & Grist Mill	do	
D. C. Way Lumber Co	Haslin	6,000,000 feet.
Pungo Lumber Co	Sidney	
J. L. Roper Lumber Co	Roper	
Pantego Ginning Co	Pantego	500 bales.
J. W. Oden & Co., Saw and Shingle Mill	Hunter's Bridge	
G. H Elliott, Saw Mill and Gin	do	
Bertie County—		
E. S. Dale	Windsor	—— vehicles.
Windsor Cotton and Peanut Co	do	600 bales.
Windsor Spoke and Lumber Co	Quitsna	
Parker Brothers	Kelford	25 caskets, 70 vehicles.
W. D. Haggard	Aulander	Vehicles and coffins.
Harrington & Co	Lewiston	Vehicles and coffins.
Bladen County—		
John Caswell, Saw Mill	Abbottsburg	
D. B. Edwards & Bro., Saw Mill	Bladenboro	
Bridgers Lumber Co	do	
Freeman & Frink Lumber Co	do	
D. B. McKey Lumber Co	Clarkton	
John O. West Lumber Co	Dawson's Land'g	
Q. T. Martin Lumber Co	White Oak	
Hanes and Co., Tool Factory	Council Station	
N. A Curry & Bro., Brick Co	Clarkton	
Brunswick County—		
Navassa Guano Co	Wilmington	
Cape Fear Fisheries Co	do	
Atlantic Fisheries Co	do	
R. W. Gibson, Shingle Mill	do	
G. F. Drew, Saw Mill	Southport	
F. N. Robbins, Saw Mill	do	
R. W. McKeithan, Saw & Grist Mill, Gin	Supply	
J. H. Sexton, Saw & Grist Mill & Gin	Winnabow	

MISCELLANEOUS—Continued.

Name of Mill.	Post-office.	Annual Output.
Brunswick County—continued.		
J. S. Henry, Saw Mill	Winnabow	
W. W. Murrell, Saw Mill	Malmo	
V. Smith, Saw and Grist Mill	Ash	
G. E. Brooks & Co., Saw and Grist Mill	Seaside	
G. F. Bowen, Fish Factory	Shallotte	
Gardner-Lacy Lumber Co	Excelsior	
Buncombe County—		
Weaverville Roller Mills	Weaverville	
Carolina Ice and Coal Co	Asheville	
Asheville Supply and Foundry Co	do	
Wm. M. Jones, Sash and Blind Mill	do	
Asheville Milling Co	do	
Asheville Ice and Coal Co	do	
Asheville Tannery	do	
Drummond Plow Co	do	
M. B. Wilkinson, Lumber Co	do	
Peoples Mills	Candler	
Jupiter Milling Co	Jupiter	
Valley Roller Mills	Hominy Creek	
Burke County—		
Bailey's Fork Roller Mills	Morganton	420,000 pounds.
Morganton Mfg. and Trading Co	do	Sash, door and blinds.
J. N. Payne Spoke and Handle Co	do	18,780 handles.
W. G. Hogan, Roller Mills	do	7,000 or 8,000 bushels.
W. A. Wortman, Roller Mill	do	
Hunting Creek Roller Mill	do	
C. B. Kincaid & Co., Roller Mill	Bridgewater	23,475 barrels.
Huffman & Mull Lumber Co	Drexel	
Huffman & Mull Flour and Corn Mill	do	
J. W. Bailey Foundry & Machine Shop	Hildebrand	
A. Y. Sigmon Lumber Co	do	
J. E. Coulter Lumber Co	Connelly Spr'gs	
J. E. Coulter Grain Mill	do	751,200 pounds.
J. D. Pitts Lumber Co	Glen Alpine	
J. D. Pitts Roller Mills	do	
Cabarrus County—		
Kerr Bag Manufacturing Co	Concord	
York Furniture Co	do	
Cannon Fertilizer Co	do	
York & Wadsworth	do	
Caldwell County—		
Gunpowder Roller Mills	Lenoir	
Builder's Supply Co	do	Lumber.
Lenoir Flour and Corn Mills	do	
J. M. Bernhardt Lumber Co	do	
Harper Furniture Co	do	
Wilson Lumber and Milling Co	do	
Penn-Cardan Lumber and Mfg. Co	do	
Gilleybrook Cannery	Granite Falls	
Dudley Milling Co	do	
Dudley Lumber Co	do	
Mountain View Cannery	Cora	
Camden County—		
Edward Garrenton Barrel Co	Riddle	
Geo. Beveridge Shuck Factory	South Mills	
Carteret County—		
Beaufort Little Neck Clam Co	Beaufort	
Dey & Bro	do	900 barrels oil, 1,000 tons fish scrap.
Enterprise Packing Co	do	
Chadwick & Caffey Oil Co	do	
T. M. Thomas Gin and Grist Mill	do	
D. S. Sanders Mill Co	do	
Bell, Westbrook, Journey & Co	do	Fish scrap.
Carteret Ice, Transport and Storage Co	Morehead City	547,500 tons.
R. S. Neal Saw Mill Co	do	
W. S. Swindell & Son Milling Co	do	Lumber.
C. S. Wallace Fish Mill Co	do	
A. T. Willis & Bro., Fish Mill Co	Smyrna	
Newport Fruit Cannery	Newport	25,000 cans.
W. S. Bell, Jr., Saw Mill	do	
G. N. Ives & Son Cannery	do	
Stewart's Fish Factory	Wildwood	
Sanders & Bro., Saw and Grist Mill	Bogue	
A. B. Riggan & Co., Cannery	Marshallburg	52,800 cans clams, 6,720 cans crabs.
Pamlico Lumber Co	Lukins	6,260,000 feet.

MISCELLANEOUS—Continued.

Name of Mill.	Post-office.	Annual Output.
Caswell County—		
King Brothers	Blackwell's	Tobacco.
E. S. Winstead Chair Factory	Milton	
Catawba County—		
Moore Milling Co	Hickory	Flour.
Hutton & Burbonnais	do	Lumber.
A. Y. Sigmon	do	Lumber.
Hickory Milling Co	do	
E. L. Shuford Manufacturing Co	do	
Phœnix Milling Co	do	
J. Hunsucker Hardwood Co	Conover	
Newton Roller Mill Co	Newton	
Monitor Mills	Claremont	
Terrell Milling Co	Terrell	
W. A. Murray Milling Co	Catawba	
J. W. Setzer Milling Co	Claremont	
Maiden Roller Mills	Maiden	
Hewitt's Roller Mills	Catfish	
D. M. Brittian & Co, Flour Mill	Cook	
Whisenot Milling Co	Jugtown	
Farmers Milling Co	Conover	
Chatham County—		
Lockville Roller Mills	Lockville	
J. E. Bryan Tannery	do	
H. Henderson, Tannery	Hadley	
J. M. McIver, Roller Mills	Gulf	
Bon Lee Roller Mill	Causey	
Ore Hill Chair Manufacturing Co	Ore Hill	4,695 dozen.
Moncure Tannery	Moncure	5,000 hides.
Cherokee County—		
J. W. Cooper Roller Mills	Murphy	
Chowan County—		
Edenton Ice and Cold Storage Co	Edenton	
Branning Manufacturing Co	do	Lumber.
M. G. Brown Lumber Co	do	
Dowdy Grist Milling Co	do	
Edenton Iron Foundry	do	
Powell Bros. Saw and Grist Mill	do	
W. E. Jordan Saw and Grist Mill	do	
O. E. Ward Saw Mill	Tyner	
J. P. Ashley Saw and Grist Mill	Clum	
Tynch Bros. Saw and Grist Mill	do	
Z. W. Evans Saw and Grist Mill	Cisco	
H. C. Nixon Saw and Grist Mill	do	
Clay County—		
J. P. & R. C. Cherry Flouring Mill	Hayesville	
Penland & Brooks Flouring Mill	do	
Mrs. V. Bell's Flouring Mill	Brasstown	
J. T. Piott & Bro. Flouring Mill	do	
Cleveland County—		
Elliott & Lattimore	Ola	
Thompson Company	Bellwood	Sash, door, blinds.
Pearl Mills	Lawndale	4,400 barrels flour and meal.
Fallston Roller Mills	Fallston	
Linberger's Wagon Mfg. Co	Shelby	
H. G. Hale	do	Cannery machinery.
Columbus County—		
Acme Manufacturing Co	Cronly	
Pine Fibre Co	do	
Butter's Lumber Co	Boardman	
Whiteville Lumber Co	Whiteville	
H. B. Short Shingle Mill	Lake Waccam'w	
D. W. Brown Lumber Mill	Cerro Gordo	
W. M. Tryert Lumber Mill	Whiteville	
J. G. Butter Lumber Co	Pireway	
S. P. Council, Jr., Tool Co	Wananish	
Craven County—		
Munger & Bennett	New Bern	10,000,000 ft. lumber. [shingles.
Broaddus & Ives	do	5,000,000 feet lumber, 100,000
New Bern Ice Co	do	
New Bern Cotton Oil and Fert. Co	do	58,000 tons seed.
Carolina Canning Co	do	260,000 cans.
Elm City Lumber Co	do	25,000,000 feet.
Pine Lumber Co	do	
Blade's Lumber Co	do	
J. S. Basnight Lumber Co	do	
Trent Lumber Co	do	
Goldsboro Lumber Co	Dover	15,000,000 feet.

MISCELLANEOUS—Continued.

Name of Mill.	Post-office.	Annual Output.
Cumberland County—		
Ward's Plow Works	Fayetteville	1,000 plows.
Cumberland Manufacturing Co	do	
Merchant Mills	do	
Fayetteville Woodenware Co	do	29,000 dozen.
Lacy Manufacturing Co	do	
Southern Cotton Oil Mill Co	do	
Fayetteville Ice Manufacturing Co	do	
McMillan Brothers	do	
E. A. Poe Brick Co	do	
Southern Pine Product Co	do	
Currituck County—		
C. R. Van De Carr	Moyock	Shuck bedding material.
C. R. Van De Carr Ginning Co	do	
Tarault & Norton	do	Woodenware, baskets, barrels, [etc.
Joseph Tarault Saw Mill	do	
W. A. Cox Saw Mill	do	
G. E. Stevenson Saw and Grist Mill	Shawboro	
T. M. Bell Saw Mill	do	
C. L. Perkins Saw and Grist Mill	Sligo	
P. N. Bray Saw Mill	do	
A. M. Willey Saw Mill	Snowden	
Davidson County—		
Dixie Furniture Co	Lexington	
Davidson Building Material Co	do	
American Furniture Co	do	
Central Manufacturing Co	do	60,000 chairs.
Elk Furniture Co	do	
Farmers Supply Co	do	
Lexington Drug Co	do	
Peacock & Adderton	do	
Southern Brass Co	do	
Cates Chair Co	Thomasville	33,900 chairs.
Cramer Furniture Co	do	313,000 chairs.
Standard Chair Co	do	
Lee Manufacturing Co	do	
Thomasville Manufacturing Co	do	12,000 chiffoniers.
Linwood Manufacturing Co	Linwood	
R Everhart & Co	Arnold	94,802 pounds plug tobacco.
Holly Grove Roller Mills	Ilex	
T. S. Dale & Co	Yadkin College	
Davie County—		
Mocksville Furniture Co	Mocksville	
Mocksville Chair Co	do	
Mocksville Roller Mills	do	
H. T. Smithdeal Tobacco Co	Advance	
Farmington Roller Mills	Farmington	
Seaford Bros. Saw Mill	Mocksville	
G. W. Green Saw Mill	do	
A. L. Betts Mantel Co	do	
W. H. Hobson Saw Mill	Jerusalem	
W. H. Swicegood Saw Mill	Tennyson	
A. C. Wood Saw Mill	Advance	
Bailey & Bailey Saw and Grist Mill	do	
W. G. Allen Saw and Grist Mill	Bixby	
A. W. Ellis Saw and Grist Mill	Farmington	
W. R. Kitchen Saw and Grist Mill	Kappa	
J. H. Harris Saw and Grist Mill	Fork Church	
H. S Davis Saw and Grist Mill	do	
J. M. Summers Saw and Grist Mill	Dulins	
Duplin County—		
Warsaw Crate Co	Warsaw	
Wellington-Patten Crate Co	Clypso	45,000 crates and barrels.
Teachey's Crate Factory	Teachey's	
Teachey's Brick and Tile Co	do	
Wallace Brick and Tile Co	Wallace	
Magnolia Manufacturing Co	Magnolia	47,000 crates. 3,000,000 baskets. 300 bales cotton ginned. 30,000 bushels corn ground.
Rose Hill Crate Factory	Rose Hill	
Murphy Crate Factory	do	
Rowland Lumber Co	Bowdens	
McMullen-Miller Lumber Co	Faisons	
Durham County—		
Carolina Furniture Co	Durham	
Durham Roller Mill Co	do	
Durham Fert. Co. (Va.-Car. Chem. Co)	do	

MISCELLANEOUS—Continued.

Name of Mill.	Post-office.	Annual Output.
Durham County—Continued.		
American Tobacco Co	Durham	
Blackwell's Tobacco Co	do	
Durham Paper Box Factory	do	$25,000.
Morris Sons Mfg. Co., Tobacco	do	
Son La Woodworking Co	do	$30,000.
Edgecombe County—		
Tar River Mills	Tarboro	Lumber.
Consumers Oil Co	do	
Southern Cotton Oil Co	do	
Tarboro Machine Works	do	
Tar River Oil Co	do	
W. L. Stallings Flour and Meal Mill	do	
Fred Hart Lumber Co	do	
Southern Ice Co	do	
Riley Phillips Lumber Co	Pine Top	
Harvey Webb Lumber Co	Macclesfield	
E. C. Wallace Lumber Co	do	
Silas Lucas Brick Co	Medora	
Conetoe Manufacturing Co	Conetoe	
Rocky Mount Brick Co	Rocky Mount	2,000,000 brick.
Rocky Mount Ice Co	do	4,000,000 pounds.
Southern Ice Co	do	
Forsyth County—		
Crawford & Ragland	Winston-Salem	50 sets tobacco shapes.
Taylor Brothers	do	430,000 pounds tobacco.
S. A. Ogburn Tobacco Factory	do	100,000 pounds tobacco.
J. A. Vance Iron Works	do	
Fogle Brothers	do	2,000,000 feet lumber.
S. J. Nissen	do	Wagons and drays.
Ogbon, Hill & Co., Tobacco Co	do	283,073 pounds plug.
C. F. Nissen	do	Wagons.
George E. Nissen & Co	do	Wagons.
Oakland Manufacturing Co	do	Furniture—$80,000.
Winston Furniture Co	do	
Salem Iron Works	do	
Spach Brothers	do	Wagons, tobacco boxes.
Winston Brick and Tile Co	do	2,000,000 brick, 50,000 feet tile.
Wachovia Mills	do	68,000 bushels.
Sou. Chem. Co. (Va.-Car. Chem. Co.)	do	30,000 tons fertilizer.
Salem Parlor Furniture Co	do	
Forsyth Iron Bedstead Co	do	
Brown & Williamson Tobacco Co	do	
R. J. Reynolds Tobacco Co	do	
W. A. Whitaker Tobacco Co	do	
Lupfert, Scales & Co. Tobacco Co	do	600,000 pounds.
Forsyth Roller Mills	do	630 bushels.
Salem Water Mills	do	
Spach Bros. & Hoover Flour Mills	do	46,950 bushels.
Fries Manufacturing and Power Co	do	
Winston Cigarette Machine Co	do	
Church Lumber Co	do	2,000,000 feet.
Winston Cockle Machine Co	do	
Martin Manufacturing Co	Walkertown	Suspenders.
N. D. Sullivan Tobacco Co	do	
Light Brothers Lumber Co	do	
Kapp & Miller Co	Rural Hall	717,345 pounds.
Harmon & Reed	Kernersville	3,225 barrels flour.
Woolsey Brothers	Bower	626,000 pounds.
L. H. Sides	Clemmonsville	Flour.
I. A. Roberson	Blews' Creek	Flour.
Franklin County—		
Laurel Dairy Farm	Laurel	Butter.
Gaston County—		
Gastonia Coffin Co	Gastonia	
Grace Roller Mill	Mt. Holly	
Graham County—		
Kanawha Hardwood Co	Robbinsville	Lumber.
Santeetlah Lumber Co	do	Lumber.
J. W. Eller	do	Lumber.
Charles Lisenbee & Son	do	Lumber.
Gilliland Locust Pin Co	Dillsboro	
Landon White	Stecoah	
Granville County—		
Taylor & Cannady Buggy Co	Oxford	2,400.
Oxford Furniture Co	do	$75,000.
J. W. Harris Mills	Wilton	Flour.
W. D. Kimball Roller Mills	Hargrove	
S. W. & M. B. Waller Mills	Knap of Reeds	7,825 barrels.

MISCELLANEOUS—Continued.

Name of Mill.	Post-office	Annual Output.
Greene County—		
Wiley Shingleton	Snow Hill	Lumber.
J. F. Harper	Snow Hill	Lumber.
L. Hardy	do	Lumber.
J. F. Britt	do	Lumber.
Z. V. Barrow	Jason	Lumber.
Zeno Lyon	Ridge Spring	Lumber.
W. R. Fields	Farmville	Lumber.
Elisha Dildy	Saratoga	Lumber.
W. M. Darden	Speight's Bridge	Lumber.
R. D. S. Dixon	Castoria	Lumber.
Exum & Dawson	Lindell	Lumber.
Guilford County—		
Snow Basket Co	High Point	
Continental Furniture Co	do	
Lindsay Chair Co	do	$50,000.
Eagle Furniture Co	do	$100,000.
High Point Coffin and Casket Co	do	
High Point Chair Co	do	6,000 chairs.
Piedmont Table Co	do	$50,000.
Union Furniture Co	do	$80,000.
Myrtle Furniture Co	do	10,000 to 12,000 desks.
Victor Chair Co	do	$18,000.
High Point Upholstering Co	do	$35,000.
Globe Home Furniture Co	do	$360,000.
Welch Furniture Co	do	$125,000.
Tate Furniture Co	do	$150,000.
High Point Bed Springs Co	do	$20,000.
Alma Furniture Co	do	$35,000—safes and tables.
High Point Furniture Co	do	$200,000.
Peerless Machine Works	do	$150,000.
J. Elwood Cox	do	$20,000—shuttle blocks, bobbin heads.
High Point Mantel and Table Co	do	$75,000.
High Point Veneering Co	do	
Southern Chair Co	do	$100,000.
High Point Metallic Bed Co	do	$100,000.
American Lumber Co	do	$100,000.
High Point Trunk and Bag Co	do	
Snow Lumber Co	do	$300,000.
W. T. Pickett Tobacco Factory	do	
High Point Show Case Works	do	$5,000.
Tomlinson Chair Manufacturing Co	do	$75,000.
High Point Milling Co	do	15,650,000 barrels.
Rankin Casket and Coffin Co	do	
High Point Buggy Co	do	
High Point Overalls Co	do	60,000 pairs.
High Point Ice and Coal Co	do	4,695 tons ice.
Lowe Trouser Co	do	62,600 dozen.
High Point Machine Works	do	$60,000—engines and saw mills.
High Point Pants Co	do	$100,000.
Carolina Manufacturing Co	do	$12,000—overalls, shirts, drawers.
National Lounge and Bed Spring Co	do	$8,000.
Jamestown Bone Meal Co	Jamestown	
Johnson Bros. & Co	do	
S. H. Ward & Sons	do	
Champlain Mills	do	
Greensboro Furniture Mfg. Co	Greensboro	
Piedmont Shuttle Works	do	
Acme Mill Works	do	
Hunter Mfg and Com. Co	do	
Coulter & Lowry Co	do	
Greensboro Table Co	do	
Pomona Terra Cotta Co	Pomona	
Halifax County—		
Carolina Peanut Co	Weldon	
Roanoke Nav. and Water Power Co	do	
Roanoke Nav., Water, Corn & F. Mill	do	
Roanoke Nav. and Water Co. Round Bale Cotton Press.	do	
Jenkins & Moody	Scotland Neck	
Harnett County—		
The John A Mackay Mfg. Co	Dunn	Edge tools and iron works.
The South Dunn Furniture Mfg. Co	do	
The Oregon Chair Factory	do	6,260 dozen chairs.
Dunn Cotton Oil Co	do	
Dunn Lumber Co	do	Sash, doors and blinds.
Cary Lumber Co	do	
Thornton Buggy Co	do	
Allen & Wells Cabinet Co	do	

MISCELLANEOUS—Continued.

Name of Mill.	Post-office.	Annual Output.
Harnett County—Continued.		
Young & David Brick Co	Dunn	
Felton Lumber Co	do	
Young & Neighbors Flour Mills	do	
O. P. Shell Flouring Mills	do	
Thos. McLamb Flouring Mills	do	
E. Lee Harness Co	do	
G. L. Canady & E. F. Young Tannery	do	
J. D. Barnes	do	Naval Stores.
G. I. Smith Cannery	do	
P. B. Farmer Lumber Co	Turlington	
W. M. Sexton Lumber Co	Long's	
William Johnson Lumber Co	Buie's Creek	
Z. T. Kivett	do	
Devereux-Turlington Lumber Co	Turlington	
J. C. & B. F. Williams	Angier	Naval stores.
Bradley Brothers Lumber Co	Bradley's Store	
A. G. Blanchard Lumber Co	May	
Harnett Lumber Co	Manchester	10,000,000 feet lumber, 860 bbls. turpentine, 200,000 bbls. rosin.
W. W. Allen Lumber Co	Bunn Level	
Lillington Brick Co	Lillington	
Bird & Faucette Lumber Co	do	
S. A. Salmon Lumber Co	do	
D. W. Price Lumber Co	Angier	
J. A. Green Lumber Co	do	
S. S. Bradley Lumber Co	Bradley's Store	
Matthews & Smith Lumber Co	do	
J. H. Stewart Lumber Co	Winslow	
L. F. Arnold Lumber Co	May	
R. F. Spence Lumber Co	Chalk Level	
Neil McLeod Lumber Co	Swann Station	
D. A. Stewart	Legal	
Haywood County—		
Waynesville Manufacturing Co	Waynesville	Wood works.
Kaolin Manufacturing Co	do	2,661,077 pounds.
Waynesville Brick Manufacturing Co	do	
W. H. Cole Lumber and Mfg. Co	do	
Junaluska Leather Co	do	
Morgan Roller Mills	Clyde	
Walker Roller Mills	Crabtree	
Henderson County—		
Carolina Canning Co	Flat Rock	
Hendersonville Mills	Hendersonville	
Pacolet Grape Juice Co	do	
Breeding & Hogard Meal and Feed Co	do	
Hendersonville Blind, Door and Sash Company.	do	
Roper's Mills	Upward	
Clayton & Warren Saw Mill	Yale	
W. T. Bennett Saw Mill	Horse Shoe	
Henderson's Chair Factory	Dewitt	
Asheville Brick and Tile Co	Fletcher	3,000,000.
Hillerbrand's Brick Factory	do	2,500,000.
Hertford County—		
Branning Manufacturing Co	Ahoskie	
J. R. Garrett Lumber Co	do	
W. P. Taylor Lumber Co	Winton	
H. S. Basnight Lumber Co	Harrellsville	
E. C. Worrell Lumber Co	Murfreesboro	
W. H. Sears Lumber Co	Union	
J. W. Freeman Lumber Co	do	
W. T. Taylor & Co. Lumber Co	Como	
James Rountree Lumber Co	St. John's	
Hyde County—		
Virginia Saw Mill Co	Makleyville	Lumber.
Alex Spring Lumber Co	do	Lumber.
Alleghany Lumber Co	Scranton	Lumber.
Willie Daniels Lumber Co	Swann Quarter	Lumber.
George T. Credle Lumber Co	do	Lumber.
A. B. Riggins & Co	do	Oyster Cannery.
Nickerbocker Lumber Co	Lake Comfort	Lumber.
J. E. Spence Lumber Co	Englehard	Lumber.
J. A. Daxsee & Son	Ocracoke	Clam Cannery.
Iredell County—		
City Roller Mills	Statesville	
Statesville Flour Mills	do	

MISCELLANEOUS—Continued.

Name of Mill.	Post-office.	Annual Output.
Iredell County—Continued.		
Railroad Flour Mills	Statesville	
Statesville Furniture Company	do	
Kincaid Furniture Co	do	
Key & Co. Furniture Co	do	
Statesville Tannery	do	
South Yadkin Flour Mills	do	
Statesville Mach'e Shop and Foundry	do	
Flanigan Harness Co	do	
Wise Ginnery	do	
Irwin & Poston	do	Tobacco.
Star Show-Case Co	do	
H. Clark & Sons	do	Tobacco.
L. C. Wagner & Co	do	Coopers and lumbermen.
J. C. Steele & Sons	do	Brick-making machines.
Mooresville Flour Mills	Mooresville	
C. K. & W. W. Melchor Flour Mills	do	
Mooresville Creamery	do	
Jackson County—		
The Harris Clay Co	Dillsboro	
Gilleland Locust Pin Co	do	
Kaolin Manufacturing Co	Waynesville	
National Abrasive Co	do	
Cullowhee Copper Co	Cullowhee	
Johnston County—		
C. M. & W. G. Wilson	Wilson's Mills	2,000,000 feet lumber.
Selma Oil and Fertilizer Works	Selma	
Neuse Lumber Co	do	
Clayton Manufacturing Co	Clayton	
Jones County—		
A. J. Collins' Gin	Maysville	
Charles McDaniel Saw Mill	Pollocksville	
John Pierce Gin	do	
F. Brock Gin	Trenton	
John Wooten Gin	do	
C. A. Rhodes Gin	Comfort	
Lenoir County—		
Hines Bros. Lumber Co	Kinston	10,500,000 feet.
Kinston Furniture Co	do	
Gay Lumber Co	do	
Kinston Mantel Co	do	
Mosley Brick and Lumber Co	do	
Kinston & Clark Brick and Tile Co	do	6,000,000.
Lenoir Oil and Ice Co	do	
Ellis Buggy and Carriage Factory	do	
Randolph Buggy and Carriage Fac'ry	do	525.
Neuse Milling Co	do	
Harrell Cart and Wagon Factory	do	
S. H. Isler Tobacco Flues Co	do	
Lincoln County—		
Pioneer Roller Mills	Lincolnton	
Piedmont Roller Mills	do	
Warlick Roller Mills	Reepsville	
Denver Roller Mills	Denver	
Mullen Roller Mills	Deer	
Howard's Creek Roller Mills	Reepsville	8,900 bushels.
Orleans Roller Mills	Orleans	
Indian Creek Roller Mills	Henry	
Motz Furniture Factory	Lincolnton	
McDowell County—		
McCall Roller Mill	Marion	
McDowell Furniture Co	do	
Bysart & Morgan Brick Co	do	
Cane Creek Roller Mills	Kerksey	9,000 bushels.
Macon County—		
Alex. Bell Wood-working and Grist Mill.	Cullasaja	
Gilliland Locust Pin Co	Franklin	
J. F. Palmer Carriage Co	do	
Potts & Bulgin Carriage Co	do	
Franklin Furniture Co	do	Caskets.
R. C. Green Furniture Co	do	
J. F. Kennedy Furniture Co	do	
J. G. Siler Grist Mill	do	
J. P. Bryson Grist Mill	do	
Harris Roller Mill	do	
J. P. Angel Harness Co	do	

MISCELLANEOUS—Continued.

Name of Mill.	Post-office.	Annual Output.
Macon County—Continued.		
Barnard & Collins Grist Mill	Franklin	
O. A. Love Mica Co	do	
L. K. Moffitt Wood-working Co	do	
Charles Cabe Wood-working Co	do	
Myers Bros. Wood-working Co	do	
Geo. Campbell Wood-working Co	do	
Ravenel Locust Pin Factory	Victory	
W. H. Higdon Grist Mill	Higdonville	
B. M. Angel Grist Mill	do	
W. J. West Grist Mill	West's Mills	
Union Lumber Co	Jarrett's	
A. J. Moore Lumber Co	Ellijay	
Thomas M. Slagle Lumber Co	Crawford	
Daniel Ravenel Pin Co	Highlands	1,000,000 pins.
Madison County—		
N. C. Land and Timber Co	Stackhouse	
Marshall Milling Co	Marshall	
Martin County—		
Dennis Simmons Lumber Co	Williamston	12,000,000 feet.
Williamston Ginning and Milling Co	do	
Everett's Lumber Co	Everetts	4,000,000 feet.
North State Lumber Co	Parmelee	
Hamilton Pants Manufacturing Co	Hamilton	
Mecklenburg County—		
Charlotte Casket Co	Charlotte	
Charlotte Oil and Fertilizer Co	do	
Carolina Manufacturing Co	do	Sash, doors and blinds.
Southern Card Clothing and Reed Co	do	
Piedmont Clothing Manufacturing Co	do	
Southern Pants Co	do	
Liddell Co	do	Machinery.
Fasnacht & Cathey	do	
Mecklenburg Iron Works	do	
Dixie Pants Co	do	
Standard Ice and Fuel Co	do	
J. H. Wearn & Co	do	
Philadelphia Candy Store	do	
Cole Manufacturing Co	do	
Relay Manufacturing Co	do	
Charlotte Trouser Co	do	
Park Manufacturing Co	do	
Davidson Cotton Seed Oil Co	Davidson	
Mitchell County—		
Mica Mill	Plum Tree	
Montgomery County—		
Allen Roller Mills	Martin's Mills	
W. W. Mills Manufacturing Co	Bisco	Lumber.
C. C. Wade & Son	Troy	Lumber.
The Bedding Lumber Co	do	
Montgomery Roller Mills Co	Star	
Z. T. Wright & Son	do	Lumber.
Hiram Freeman & Son	Ether	Lumber.
Ether Lumber Co	do	
Ether Wagon Manufacturing Co	do	
Star Lumber and Manufacturing Co	Asheboro	
Guilford Lumber Co	Troy	
Smitherman Roller Mill	do	
Penn Lumber Co	do	
Frank McAuley Roller Mill	Mt. Gilead	
Star Lumber Co	Star	
Moore County—		
Jonesboro Mills	Jonesboro	
Jonesboro Sash and Blind Co	do	$25,000.
Faushee & Snypes Buggy Co	do	
Tyson & Jones Buggy Co	Carthage	2,000 vehicles.
Carthage Tannery Co	do	
Carthage Sash and Blind Co	do	
Currie & McQueen Lumber Co	do	
Moore County Brick Co	Southern Pines	2,000,000 brick.
I. L. Hamlin Co	do	Lumber.
Tar Bell Lumber Co	Aberdeen	
Penn Lumber Co	do	9,600,000 feet.
Sanford Furniture Co	Sanford	$80,000.
Sanford Sash and Blind Co	do	$40,000.
Sanford Brick Co	do	
Crabtree & Fitts Furniture Co	do	
Petty Fruit Growing and Canning Co	Cameron	

MISCELLANEOUS—Continued.

Name of Mill.	Post-office.	Annual Output.
Nash County—		
Rocky Mount Manufacturing Co	Rocky Mount	6,000 coffins.
Rocky Mount Sash and Blind Factory	do	$30,000.
Rocky Mount Oil and Fert. Works	do	
Tar River Lumber Co	do	9,390,000 feet.
Swift Creek Dairy and Stock Farm	Battleboro	9,390 pounds butter.
Battleboro Oil Mills	do	6,260 tons.
Farmers Oil Mill	Nashville	6,260 tons.
Nash County Lumber Co	do	6,000,000 feet.
Emery & Chappell Lumber Co	do	2,500,000 feet.
Nashville Gin Co	do	1,000 bales.
Springhope Gin Co	Springhope	
New Hanover County—		
Navassa Guano Co	Wilmington	
Spirittine Chemical Co	do	91,150 gallons.
Olive Canning Factory	do	
Cape Fear Lumber Co	do	
Pine Product Co	do	54,000 gallons pine oil, 24,000 bushels charcoal.
L. A. Weedon Shuttle Block Factory	do	
Boney & Harper Milling Co	do	300,000 bushels.
Hydraulic White Brick Co	do	4,000,000 brick.
Hilton Lumber Co	do	
Angola Lumber Co	do	
Pittsburg Lumber Co	do	
Pannell Paint and Paint Solder Co	do	
A. H. Slocomb Cooperage Co	do	
Independent Ice Co	do	18,780 tons.
W. E. Worth & Co	do	
Victor B. Britton Shingle Co	do	30,000 shingles.
Cape Fear Manufacturing Co	do	18,000 dozen articles.
Fore & Foster P. M. and S. B. Co	do	5,000,000 feet lumber.
Wilmington Stamp Works	do	
Willard Bag Manufacturing Co	do	2,000,000 bags and overalls.
The Sneed Co	do	Mattress.
Skinner's Ship Yard	do	
Wilmington Iron Works	do	
N. C. Cotton Oil Co	do	
Atlantic Manufacturing Co	do	80,000 pounds baking powders.
R. W. Hicks	do	283,000 gals. cider and vinegar.
E. Warren & Son	do	Candy.
C. W. Yates & Co	do	Picture frames.
J. C. Brown	do	Vehicles.
Kidder Lumber Co	do	6,260,000 feet.
E. V. Richards	do	Stained glass.
American Chemical and Textile Coloring Co	do	
C. H. Dock & Co	do	Turpentine.
The George L. Morton Co	do	
Northampton County—		
Woodland Manufacturing Co	Woodland	
Jackson Buggy Co	Jackson	
Garysburg Manufacturing Co	Garysburg	
Onslow County—		
Swansboro Lumber Co	Swansboro	
Pannel-Eccleston Lumber Co	Jacksonville	
W. R. Deppe Saw Mill	Deppe	
R. D. Thompson Saw Mill	Richlands	
Hudson & Strange Saw Mill	Catharine Lake	
Williams & Williams Saw Mill	Flox	
Samuel Bacon Saw Mill	Stump Sound	
Wiley N. Marine Saw Mill	Marines	
A. M. Prince Saw and Planing Mill	Holly Ridge	
Orange County—		
Efland Milling Co	Efland	43,820 bushels.
Pamlico County—		
Reelsboro Barrel Co	Reelsboro	Laths.
Campbell & Cowell	Bayboro	Barrels.
A. Midgett	Oriental	Barrels.
J. B. Lee & Son	Arapahoe	Barrels.
Reel & Reel Gin and Grist Mill	do	
Bunting & Bro. Saw Mill	do	
J. B. Watson Gin and Grist Mill	Lowland	
D. C. McCotter & Bro. Gin and Grist Mill.	Messic	
J. C. Muse Gin and Grist Mill	Vandemere	
S. F. McCotter & Bro. Gin and Grist Mill.	do	
W. E. Lukens Saw Mill	do	

MISCELLANEOUS—Continued.

Name of Mill.	Post-office.	Annual Output.
Pamlico County—Continued.		
C. H. Swan Gin and Grist Mill	Merrett	
C. H. Fowler & Co. Gin and Grist Mill	do	
J. F. Cowell Cotton Gin	Bayboro	
E. H. Pickles Shingle and Saw Mills	do	
A. B. Campin Saw Mill	do	
Cowell, Swann, McCotter & Co	do	Guano.
W. E. Lukens Saw Mill	Stonewall	
C. H. Fowler Gin and Grist Mill	do	
W. H. Powers & Co. Gin and Grist Mill	Oriental	
W. B. Blade Lumber Co	do	
R. D. Hodges Cotton Gin	do	
Wood & Dean Saw Mill	Pamlico	
J. F. Davenport Cotton Gin	do	
J. B. Reel & Co. Gin, Saw and Grist Mills.	Reelsboro	
Reel & Jones Saw Mill	do	
N. H. Booker Gin and Saw Mill	Grantsboro	
Samuel Campen Gin and Saw Mill	Alliance	
Pasquotank County—		
Elizabeth City Plow Co	Elizabeth City	
Crystal Ice and Coal Co	do	6,260 tons ice.
Euclid Height Co	do	1,560 dozen brooms.
Elizabeth City Buggy Co	do	
Robinson Packing Co	do	
Elizabeth City Lumber Co	do	
Kramer Bros & Co	do	
Elizabeth City Manufacturing Co	do	
East Coast Cedar Co	do	
N. C. Iron Works	do	
Elizabeth City Milling Co	do	
Elizabeth City Brick Co	do	
The Ball Cultivator Co	do	
The Elizabeth City Iron Works	do	
N. R. Zimmerman & Co	do	
W. M. Baxter Ice and Cold Storage Co	do	
The Blades Lumber Co	do	25,000,000 feet.
N. C. Tray and Basket Co	do	
T. A. Commander & Sons	do	
The Elizabeth City Packing Co	do	200,000 bushels oysters, 20,000 bushels peas, 50,000 bushels tomatoes.
Thompson Brick Works	do	
Pender County—		
Pender Lumber Co	Burgaw	
Perquimans County—		
Fleetwood & Jackson Lumber Co	Hertford	
Major & Loomis Lumber Co	do	
W. H. Ward Coffin Co	do	
McMullen Bros. Buggy Co	do	
Walter White Shingle Co	Belvidere	
James Four Shingle Co	Chapanoke	
Person County—		
Roxboro Cannery	Roxboro	
Roxboro Planing Mill	do	
R. W. Massie Planing Mill	do	
Chub Lake Roller Mill	Chub Lake	
Massie Saw Mill	Allensville	
Pitt County—		
Winterville Canning Co	Winterville	
Hunsucker Edge Co	do	
Greenville Hogshead Co	Greenville	
Nansemond Packing Co	Bethel	
Ayden Lumber Co	Ayden	
Polk County—		
Tryon Mills	Lynn	
Randolph County—		
Pearl Roller Mills	Randleman	
Ashboro Furniture Co	Ashboro	
Ashboro Lumber Manufacturing Co	do	
Ashboro Roller Mills	do	
Crown Milling Co	do	
Randolph Chair Co	do	
Archdale Roller Mills	Archdale	
Dixie Chair Co	Trinity	
Alberta Chair Works	Ramseur	

MISCELLANEOUS—Continued.

Name of Mill.	Post-office.	Annual Output.
Richmond County—		
J. B. Caudel Co	Rockingham	
H. D. Baldwin Co	do	
Robeson County—		
Maxton Sash and Door Co	Maxton	
Red Springs Lumber Co	Red Springs	
J. T. Denny & Co	Rennert	
Sadlerty Lumber Co	do	
Alma Lumber Co	Alma	
Kingsdale Mills	Kingsdale	
Breece & McCormick Saw Mill	Pembrook	
Southeastern Lumber Co	Ashpole	
Oden & Johnson	St. Paul's	
Rockingham County—		
B. F. Ivey	Leaksville	30,000 pounds plug tobacco.
A. H. Mothey Co	Reidsville	250,000 pounds plug tobacco.
Rowan County—		
Mt. Ulla Roller Mills	Mt. Ulla	
Rockwell Furniture Co	Rockwell	
Millbridge Roller Mills	Millbridge	1,140,000 pounds.
China Grove Roller Mill	China Grove	
Cleveland Veneering Mfg. Co	Cleveland	
Salisbury Ice and Fuel Co	Salisbury	
Salisbury Roller Mill	do	28,000 barrels flour, 62,600 bushels meal.
Northside Roller Mill	do	
Salisbury Brick and Tile Co	do	500,000 brick.
Brown Manufacturing Co	do	2,500 suits furniture.
Salisbury Mattress Co	do	
Rutherford County—		
C. M. Champion Roller Mills	Rutherfordton	8,000 bushels.
I. S. Rowland & Co. Roller Mills	do	
R. P. Grier Roller Mills	Gilkey	1,200 barrels.
Z. V. Grier Roller Mills	Forest City	
T. F. Elliott Roller Mills	Hollis	
Scotland County—		
Laurinburg Oil Co	Laurinburg	160,000 gallons oil, 150,000 tons meal.
Carolina Harness Co	do	
Stanly County—		
Harwood Roller Mills	Bridgeport	
Tucker & Carter Rope Co	New London	1,565,000 pounds.
Albemarle Furniture Mfg. Co	Albemarle	
Albemarle Roller Mills	do	
I. W. Suggs Machine Shops	do	
Sibley Bros. Machine Shops	do	
Plyler Roller Mills	Plyler	18,780 barrels.
Port Roller Mills	Millingport	
Big Lick Roller Mills	Big Lick	
Efird Roller Mills	Whitney	1,100,000 pounds.
American Roller Mills	Richfield	7,800 bushels wheat.
Norwood Roller Mills	Mt. Pleasant	
Miller Bros. Roller Mills	Dowd	
Efird Manufacturing Co	Albemarle	2,616,000 pounds.
Stokes County—		
Sheppard Brothers	Dellar	$2,000.
Fogg Brothers	Walnut Cove	800,000 feet lumber.
Surry County—		
Hadley-Smith Co	Mt. Airy	
Banner Chair Co	do	
Mt. Airy Furniture Co	do	7,200 suits furniture.
National Furniture Co	do	
Mt. Airy Granite Co	do	$85,000.
Mt. Airy Lumber Co	do	
Worth & Worth Mill Co	do	
Mrs. A. E. Sides Milling Co	do	
R. K. Marshall Milling Co	do	Lumber.
J. E. Spaugh Foundry	do	
Spaugh & Bussic Co	do	
Prather-Whitlock Tobacco Co	do	
Mt. Airy Buggy Co	do	
James Shoub Wagon Co	do	
R. D. Harris & Bro. Wagon Co	do	
J. F. Kirkham Manufacturing Co	Pilot Mountain	
Dodson Bros. Tobacco Co	do	
Pilot Furniture Co	do	
Dodson Mill Co	do	
Elkin Canning Co	Elkin	
Elkin Furniture Co	do	

MISCELLANEOUS—Continued.

Name of Mill.	Post-office.	Annual Output.
Surry County—Continued.		
Bailey Manufacturing Co	Elkin	
W. R. Doss	Copeland	
Whiteplains Buggy Co	Whiteplains	
S. E. Marshall Wagon Co	do	
J. S. Marshall Lumber Co	do	
Dobson Buggy Co	Dobson	
Siloam Roller Mills	Siloam	
J. D. Hamlin Roller Mills	Rockford	
Westfield Roller Mills	Westfield	
Swain County—		
N. C. Talc Mining Co	Hewitt's	2,000 tons.
G. W. Moore & Co	Bryson City	
Franklin & Brown	do	100,000 lumber.
W. L. Ellis	Almond	
Transylvania County—		
The Brevard Roller Flour Mills	Brevard	
Tyrrell County—		
Pine Lumber Saw Mill	Columbia	
J. D. Newberry	do	Coach.
D. A. Sample	do	Coach.
R. J. Hassell Saw Mill	do	
Fleetwood & Jackson Lumber Co	Gudger	
George A. Hussey	Gum Neck	Coach.
Union County—		
Monroe Oil Mills	Monroe	
Henderson Roller Mills	do	
Shute & Sons Sash and Blind Factory	do	
Vance County—		
Corbett Buggy Co	Henderson	3,000 vehicles.
Henderson Cotton Gin	do	
Henderson Ice and Cold Storage Co	do	
N. C. Oil Co	do	
Wake County—		
Farina Roller Mills	Raleigh	
States Prison Brick Yard	do	
States Prison Mattress Factory	do	
Caraleigh Phos. and Fert. Works	do	
J. H. Gill Foundry	do	
Allen & Cram Machine Co	do	
Norwood Cigar Co	do	750,000 cigars
Carolina Ice Co	do	
Raleigh Ice and Electric Co	do	
N. C. Building and Supply Co	do	
Raleigh Manufacturing Co	do	
Raleigh Mfg. and Supply Co	do	
Mills Manufacturing Co	do	
W. B. Dunn Plow Co	Wake Forest	
Wake Forest Canning Co	do	
Warren County—		
Warrenton Roller Mills	Warrenton	
Warrenton Furniture Co	do	75,000 chairs.
Washington County—		
Walker & Myers	Plymouth	5,000,000 feet lumber.
Witt's Veneering Co	do	
Plymouth Milling Co	do	3,000,000 feet lumber, 6,000,000 shingles.
J. M. Reid & Son	do	
H. Peal Buggy Co	do	
Blount Milling Co	Roper	135,000 pounds lint cotton, 15,000 bushels meal.
Roper Lumber Co	do	15,000,000 feet lumber.
S. J. Barco Buggy Co	do	
Needham & Jackson	Hoke	
T. J. Basnight	Scuppernong	
W. F. Phelps' Mill	Cherry	
A. Alexander	Creswell	
Watauga County—		
Mast & Bingham Roller Mill	Sugar Grove	
John W. Dye	St. Jude	600 vehicles.
Triplett Locust Pin Factory	Triplett	960,000 pins.
Call & Smith Locust Pin Factory	Stony Fork	1,565,000 pins.
Wayne County—		
Goldsboro Ice Co	Goldsboro	
Enterprise Lumber Co	do	12,520,000 feet.
Goldsboro Brick and Tile Works	do	
Goldsboro Buggy Co	do	1,800 vehicles.

MISCELLANEOUS—Continued.

Name of Mill.	Post-office.	Annual Output.
Wayne County—Continued.		
Wayne Agricultural Works	Goldsboro	
R. E. Jones Buggy Co	do	
Carolina Rice Mills	do	125,000 bushels.
H. Weil & Bros. Brick Yard	do	3,500,000 brick.
Griffin's Brick Yard	do	
Goldsboro Furniture Co	do	
Southern Cotton Oil Co	do	
Acme Machine Works	do	
Goldsboro Table Co	do	
Griffin's Shingle Mills	do	
Bell Lumber Co	Mt. Olive	
Wilkes County—		
R. A. Spainhour & Co	Wilkesboro	Locust pin, sash, doors, etc.
C. C. Smoot & Sons Tannery	do	1,500,000 pounds leather.
Winkler & Smith	do	Locust pins.
Call & Combs	do	6,000,000 locust pins.
J. L. Webster	do	Vehicles.
Forest Furniture Co	N. Wilkesboro	
Wilkesboro Manufacturing Co	do	Sash, doors and blinds.
J. V. Wallace Foundry	do	$1,200.
J L. Turner Coffin Co	do	1,200 coffins.
Wilkes Lumber Manufacturing Co	do	1,908,000 feet lumber.
Hackett Bros. Flour Mill	do	
The W. M. Absher Co	do	Pins, brackets, cross-arms, etc.
W. C. Meadows & Sons Flour Mills	Moravian Falls	
Moravian Falls Manufacturing Co	do	Flour.
Roaring River Manufacturing Co	Roaring River	Cross-arms, etc.
Quarry Milling Co	Quarry	Flour.
Wilson County—		
Hackney Bros	Wilson	Vehicles.
Carolina Brights Cigarette Co	do	
Wilson Ice Co	do	9,390,000 pounds.
Briggs & Simms	do	Sash, doors and blinds.
W. T. Hewlett Harness Co	do	
G. H. Wainwright Plow Factory	do	
Silas Lucas Brick Co	do	500,000 brick.
Elm City Cotton Oil Co	Elm City	
Tilgham Lumber Co	do	
John L. Bailey Brick Co	do	
Yadkin County—		
Boonville Milling Co	Boonville	
Morse & Wade	East Bend	100,000 pounds.
Clyde Roller Mills	Cane River	
Yadkinville Roller Mills	Yadkinville	
Yadkin Valley Roller Mills	do	
N. C. Hardwood Co	do	
Yancey County—		
Cane River Roller Mills Co	Cane River	6,260 barrels.
Hetta-Ida Milling Co	do	
Brawley & Smith Saw Mill	Huntsdale	
Jas. A. Martin Saw Mill	Johnson City	
Bald Creek Mills	Bald Creek	5,000 bushels.

CATTLE REGISTER.

Name of Owner.	Post-office Address.	Name of Breed.	No. Registered.	No. Entitled to Registration.
Alamance County—				
R. W. Scott	Melville	Jersey	16	2
McBride Holt	Graham	do	1	4
Holt & Homewood	Burlington	Devon	27	8
Do	do	Ayrshire	14	4
Do	do	Dutch Belted	12	3
Alleghany County—				
H. F. Jones	Sparta	Shorthorn		1
P. C. Huggins	Eunice	do		20
J. W. Hawthorn	Annie	do		5
S. A. Shoal	Sparta	do		4
A. A. Woodruff	Cherry Lane	do		5
Ashe County—				
John Dent	Jefferson	Shorthorn	1	10
W. T. Colrod	Orion	do		15
Mrs. J. Y. Noll	Jefferson	do		8
Walter Hamilton	Beaver Creek	do	1	10
Walter Faw	do	do	1	5
J. W. Wilcox	Dresden	do	1	6
John Baker	do	do		10
J. P. Perkins	Helton	do	5	5
R. A. Hamilton	Beaver Creek	Jersey	1	
Daniel W. Adams	Venus	do	1	
Ambrose Clark	Weasel	Shorthorn	1	
W. C. Greer	Grassy Creek	do	13	
Beaufort County—				
H. H. Broome	Aurora	Jersey		5
Bladen County—				
A. J. Groves	Cypress Creek	do		
Buncombe County—				
Biltmore Farms, Geo. W. Vanderbilt.	Biltmore	do	265	
J. E. Lytle	Arden	do		
Burke County—				
Amos Huffman	Pearson	do		
D. R. Huffman	do	do		
D. F. Huffman	do	do		
Joel Cloud	do	do		
J. D. Alexander	Morganton	Jersey and Guernsey		8
Caldwell County—				
Green Park Hotel Co	Patterson	Holstein		
Joseph Powell	Lenoir	Jersey		
George Goforth	do	do		
Camden County—				
Willis Ferebee	Belcross	do		
K. V. Stevens	Camden	do		
Catawba County—				
Jno. W. Raburn & Son	Hickory	Devon	6	5
R. L. Shuford	Newton	Jersey	25	40
Chatham County—				
J. G. Hanner	Siler City	do	1	
J. M. Foust	Ore Hill	Holstein		
Cherokee County—				
J. E. Dickey	Ranger	Durham		20
E. M. Deaver	Letia	do		
Clay County—				
McClure & Bumgarner	Hayesville	Black Polled Angus	2	3
W. T. Bumgarner	do	Devon	3	2
J. P. Cherry	do	do		1
Thomas Phillips	do	Rone Durham		4
Ed. Shearer	Shearer	Red Durham		2
A. D. Evans	Tusquitte	Rone Durham		
R. N. Penland	Elf	Red Poll	1	
Columbus County—				
J. L. Memory	Whiteville	Jersey	1	1
A. F. Toon	do	do		1
S. E. Memory	do	do		1
Mrs. Lee Powell	do	do		1
Mrs. S. A. Smith	Rico	do	1	1
J. P. Council	Wannanish	Devon	4	4
Craven County—				
W. F. Crockett	New Bern	Jersey	8	
John Humphrey	Clark	do		6

CATTLE REGISTER—Continued.

Name of Owner.	Post-office Address.	Name of Breed.	No. Registered.	No. Entitled to Registration.
Cumberland County—				
Bailey Evans	Sherwood	Jersey		
Marcus Marsh	Alderman	do		
Davidson County—				
Ed. Clodfelter	Thomasville	Jersey		
A. E. Andrews	Light	do		
Holt Farm	Linwood	Devon	1	9
Duplin County—				
Durant Williams	Leon	Jersey		
Mrs. M. E. Pass	Faison	do		
Edgecombe County—				
N. C. Dep. of Agric'ure	Rocky Mount	Aberdeen-Angus	3	11
John L. Cherry & Bro	Coakley	Jersey		
Forsyth County—				
H. E. Fries	Winston-Salem	Guernsey		
S. A. Ogburn	do	do		
H. W. Johnson	do	do		
A. B. Atwood	do	Jersey		
Franklin County—				
W. L. McGehee	Franklinton	do		
Gaston County—				
J. T. R. Dameron	Bessemer City	do	3	10
Jack Kime	do	do		
Moses Stroup	do	do		
Ed. Kennedy	do	do		3
W. A. Kendrick	do	do		5
J. A. Torance	do	do		10
J. T. R. Dawson	do	do		5
R. L. Abernathy	Mountain Island	do		
Gates County—				
Dr. E. F. Cubell	Sunsbury	Holstein		
R. Hoflun	do	Jersey		
Guilford County—				
S. W H. Smith	Guilford College	do	4	6
L. W. Smith	do	do	4	2
R. L. Smith	Cascade	do	6	6
H. Davis	Guilford College	do	2	6
Granville County—				
W. L. Taylor	Bullock	do		3
W. Jenkins	do	do		
John Watkins	Buchanan	do		
Halifax County -				
H. S. Harrison	Medoc	do		
Ed. Simpson	Ringwood	Hereford	11	
S. Johnston	Littleton	Jersey		
S. W. Albertson	Scotland Neck	do	5	3
E. T. Whitehead	do	do	3	
George K. Moore	do	do	5	
R. A. Gray	do	do	3	
Haywood County—				
M. J. McCracken	Crab Tree	Shorthorn	4	1
J. McD. Michal	Springdale	Devon	1	
James McGwyn	do	do	1	
Henderson County—				
Westfeldt Bros	Fletcher	Shorthorn	6	10
Hyde County—				
John M. Mann	Middletown	Jersey	4	
George I. Watson	Wysocking	do	3	
Iredell County—				
N. F. Blackwelder	Dunlap	Devon	1	2
C. L. Sherron	Shinville	Jersey		
W. A. McClain	do	do		
Jackson County—				
T. H. Leatherwood	Webster	do		5
Daniel Snider	do	Devon		
Thomas A. Cox	Cullowhee	Holstein		
A. J. Long, Sr	Webster	Jersey		
M. M. Buchanan	Sylva	Holstein		
Lenoir County—				
W. L. Kennedy	Falling Creek	Jersey		
McDowell County—				
T. B. Sandis	Dysartsville	do		
R. H. Cowan	do	do		
G. E. Cowan	do	do		
J. R. Patten	Patten	do		
W. C. Nesbitt	Stone Mountain	Shorthorn, Durham		

CATTLE REGISTER—Continued.

Name of Owner.	Post-office Address.	Name of Breed.	No. Registered.	No. Entitled to Registration.
Macon County—				
N. L. Barnard	Franklin	Red Polled		10
Lee Crawford	do	do		4
S. L. Rogers	do	Durham	3	
George A. Jones	do	Devon	2	2
G. R. Patton	do	Red Polled	2	
C. W. Slagle	Crawford	Devon	3	
Martin County—				
Justus Everett	Conoho	Jersey		
Mecklenburg County—				
J. M. Davis	Charlotte	do	4	6
W. N. Flenneker	do	Red Polled	2	1
W. S. Pharr	do	do	4	7
J. M. Kirkpatrick	do	Jersey		
George W. Phifer	do	Guernsey	5	6
R. B. Orr	Kent	Jersey		
R. B. Caldwell	Charlotte	do		
Andy Christenberry	Newells	Jersey, Guernsey		
James & W. Cochran	Derita	Jersey		10
W. J. Hutcheson	Nevin	do		18
James T. Kell	Fort Mills	do		10
S. H. Kell	do	do		10
James P. Ardrey	do	do		8
W. E. Ardrey	do	do	6	25
Mitchell County—				
J. G. Phillips	Ingalls	Devon		
A. A. Wiseman	Elsie	do		
Montgomery County—				
E. C. Winfrey	Pekin	Jersey, Holstein		
M. A. Bennett	Marcus	Jersey		2
G. W. Harris	do	do		3
Moore County—				
J. C Thomas	Grotto	Jersey	2	3
Nash County—				
C. D. Morgan	Finch	Jersey		3
T. P. Braswell	Battleboro	do	75	25
R. H. Ricks	Rocky Mount	do		
Orange County—				
J. S. Carr	Durham	Jersey	12	
Pender County—				
D. L. Farrior	Maple Hill	Jersey	320	
J. H. Hufham	Canetuck	Jersey and Devon	3	
Randolph County—				
R. Swain	Liberty	Jersey		
J. M. Williams	do	do		
W. T. York	Mullen	do		
Alfred Jones	do	do		
John Beeson	Randleman	do		2
Solomon Adams	do	do	2	
Richmond County—				
J. P. Leak	Rockingham	Hereford	4	2
Do	do	Angus	2	2
Rockingham County—				
R. A. Stokes	Ruffin	Jersey		4
A. L. French	Fitzgerald	Aberdeen-Angus	27	
W. K. Gibbs	Reidsville	Jersey	3	6
Geo. J. Meador	do	do	2	5
P. B Johnston	do	Holstein	4	3
Rowan County—				
J. M. Harrison	Millbridge	Jersey		
J. S. Wall	Blackmer	do		
Rutherford County—				
J. W Thompson	Rutherfordton	Jersey		
Ben Thompson	Cliffdale	do		
I. N. Miller	Island Ford	do		
W. A. Thompson	Rutherfordton	do	3	
E. Thompson	Cliffdale	do	7	
G. W. Long	do	do	8	
M. O. Dickerson	Rutherfordton	do	4	
A. L. Gwyn	do	do	2	
C. C. Reid	do	do	2	
R. L. Hampton	do	do	3	
Stokes County—				
E. R. Vass	Walnut Cove	Jersey		
W. M. Chesman	Pine Hall	do		

CATTLE REGISTER—Continued.

Name of Owner.	Post-office Address.	Name of Breed.	No. Registered.	No. Entitled to Registration.
Surry County—				
A. Chatham	Elkin	Devon	2	16
H. G. & R. M. Chatham	do	do	4	8
W. T. Ward	Forge	Jersey	1	
J. H Armstrong	do	do	1	
Swain County—				
T. D. Bryson	Bryson City	Devon		
Dr. J. H. Teague	Whittier	Holstein		
Wm. Monteith	Bushnell	Red Polled		
D. K. Collins	Bryson City	Jersey		8
Wake County—				
Experiment Station	Raleigh	Aberdeen-Angus	4	15
J. D. Whitaker	do	Jersey	28	7
R. H. Lewis	do	Guernsey	15	5
Experiment Station	West Raleigh			
A. and M. College	do			
State Insane Hospital	Raleigh	Jersey and Holstein		
Warren County—				
Grant Beardsley	Manson	Jersey		
J W Smithwick	Axtell	do		
W. B. Fleming	Warrenton	Devon		
Watauga County—				
J. S. Winkler	Boone	Durham		
L. A. Norris	Norris	do		
D. F. Baird	Valle Crucis	Hereford		
W. H. Coan	Blowing Rock	do	2	1
J. L. Hayes	Vilas	Shorthorn		4
G. C. Winkler	Boone	do	2	8
M. N. Cane	Blowing Rock	Hereford		
Edmond Shipley	Valle Crucis	do	3	5
S. C. Winkler	Boone	do		
C. S. Farthing	Hattie	Shorthorn		
Wayne County—				
W. F. Rose	Goldsboro	Jersey		4
A. L. Sasser	do	do		5
Oscar Farrior	do	do		9
John Davis	do	Holstein		2
J. M. Wood	Beston	Jersey		

SWINE REGISTER.

Name of Owner.	Post-office Address.	Name of Breed.	No. Registered.	No. Entitled to Registration.
Alamance County—				
Holt & Homewood	Burlington	Poland China	7	16
Alexander County—				
Nathan Icenhour	Whittenburg	Berkshire		2
Lafayette Bowman	Bentley	do		2
T. J. Miller	Lackey	Essex		2
Smith Bros	Taylorsville	Berkshire		9
R. C. Lackey	Hiddenite	do		9
Wm. Burkeley	Mt. Pisgah	do		5
R. C. Allen	York Institute	do		8
F. F. Murdock	do	do		5
A. C. Payne	Taylorsville	do		2
Alleghany County—				
Lowel Choat	Laurel Springs	Poland China		
Wm. Woodruff	Sparta	do		
Cheek & Transon	Montland	do		
Monroe Wagoner	do	do		
McD. Wagoner	Whitehead	do		
Ashe County—				
Mrs. J. Y. Neal	Jefferson	Berkshire		20
J. P. Perkins	Helton	Poland China		20
Young Bros	do	do		8
W. G. Thompson	Grassy Creek	do		
T. D. Jones	do	do		
S. G. Parsons	do	do		
Bladen County—				
D F. Melvin	Cypress Creek	Poland China		
D. L. Cromartie	do	Berkshire		

SWINE REGISTER—Continued.

Name of Owner.	Post-office Address.	Name of Breed.	No. Registered.	No. Entit to Registration.
Brunswick County—				
J. A. Inman	Excelsior	Ches. White, Po. China		
Buncombe County—				
Geo. W. Vanderbilt	Asheville	Berkshires	185	
Burke County—				
Amos Huffman	Pearson	Berkshires		
D. R Huffman	do	do		
D. F. Huffman	do	do		
Joel Clark	do	do		
Robert Winkler	Bridgewater	Poland China		20
Manly McDowell	Morganton	do		50
Cabarrus County—				
G. T. Ritchie	Govern	Poland China		
Caldwell County—				
A. Bolick	Blowing Rock	Poland China		2
Carteret County—				
J. W. Saunders	Bogue	Poland China		
Charles Barker	Stella	do		
Catawba County—				
John W. Rabon & Son	Hickory	Essex		6
R. L. Shuford	Newton	Poland China		
Chatham County—				
Henry H. Jordan	Jordan	O. I. C		2
O. Clapp	Siler City	Poland China		
Clay County—				
J. B. Brown	Hayesville	Berkshire		4
R. L. Herbert	do	do		6
J. G. Hipps	do	do		4
W. J. R. McConnor	Clarence	do		6
Thomas Phillips	Hayesville	do		12
Columbus County—				
J. L. Memory	Whiteville	Poland China		8
A. F. Toon	do	do		10
Mrs. S. A. Smith	Rico	do	2	
John D. Straus	Bolton	Berkshire	4	
Craven County—				
Tim McCoy	Cove	Berkshire		30
H. F. White	do	do		20
Cumberland County—				
Bailey Evans	Sherwood	Essex		
Davidson County—				
E. H. Dorsett	Eden	Poland China		4
Holt Farm	Linwood	do	1	4
Lafayette Smith	Leon	do	3	3
Edgecombe County—				
N. C. Dep. of Agricul.	Rocky Mount	Berkshire	5	
John L. Cherry & Bro.	Coakley	do		
Forsyth County—				
J. S. Conrad	Blakeley	Berkshire	3	4
C. A. Jones	Winston-Salem	do		
H. E. Fries	do	Duroc-Jersey		
J. E. Mickey	Daisy	Chester, White		
H. W. Johnson	Winston-Salem	Berkshire		
Franklin County—				
W. R. McGhee	Franklinton	Duroc-Jersey		
Gaston County—				
Jacob Kime	Bessemer City	Poland China		2
Moses Stroup	do	Berkshire		
G. A. Gold	do	do		1
Gates County—				
Nathan Riddick	Trottville	Duroc-Jersey		
Guilford County—				
G. W. H. Smith	Guilford College	Poland China		10
Haywood County—				
J. M. Gwynn	Springdale	Berkshire		
J. M. Michael	do	do		
A. J. Osborn	Canton	Poland China		
Henderson County—				
Westfeldt Brothers	Fletcher	Berkshire	6	20
Hyde County—				
W. D. Mann	Wysocking	Essex		3
W. D. Swindell	Swann Quarter	Berkshire	3	
Ed. Bridegroom	do	Poland China		3
Iredell County—				
C. L. Shinn	Shinnville	Berkshire		

SWINE REGISTER—Continued

Name of Owner.	Post-office Address.	Name of Breed.	No. Registered.	No. Entitled to Registration.
Iredell County—Contin'd.				
A. L. Milligan	Stony Point	Poland China		
C. A. Lacky	do	Essex		
Jackson County—				
T. H. Leatherwood	Webster	Duroc-Jersey		
McDowell County—				
G. C. Dllington	Dysartsville	Berkshire		
C. H. Mangum	do	Poland China		
W. H. Taylor	do	do		
R. H. Cowan	do	Berkshire		
G. E. Cowan	do	do		
J. R. Patten	Patten	do		
M. F. Tate	do	do		
A. G. Tate	do	do		
A. E. Rowe	do	do		
S. P. Tate	do	do		
W. C. Nesbitt	Stone Mountain	O. I. C		
Macon County—				
F. S. Johnson	Franklin	Poland China	4	6
W. E. McDonald	do	do		6
H. H. Jarrell	do	Berkshire		2
W. R. Stallings	do	O. I. C		8
C. J. Harris	do	Berkshire		
Martin County—				
Justus Everett	Conoho	Berkshire		
Mecklenburg County—				
J. M. Davis	Charlotte	Berkshire		
Charley Cresswell	do	do		
L. D. Faulkner	do	do		
J. G. Harriss	do	do	4	
W. S. Pharr	do	do	12	8
N. S. Alexander	Shamrock	do	4	
William McKee	Matthews	do		
George M. Phifer	Charlotte	do		2
R. B. Orr	Kent	Essex		
J. R. Hutchinson	Querys	Berkshire		
L B. Sloop	Exact	do		
M. G. Clark	Sandifer	do		
Maj. Harris	Charlotte	do		
Jos. & E. G. Wardin	Nevin	Duroc-Jersey		6
Mitchell County—				
J. G. Woody	Clarissa	Essex		
M. Young	do	do		
Montgomery County—				
E. C. Winfrey	Pekin	Berkshire		
M. A. Bennett	Marcus	do		2
G. W. Harris	do	do		2
Nash County—				
C. D. Morgan	Finch	Poland China		35
T. P. Braswell	Battleboro	do	25	50
Orange Counry				
J. S. Carr	Durham	Poland China and Essex.	9	
Pender County—				
D. L. Farrior	Maple Hill	Poland China	3	
Randolph County—				
J. B. Slack	Why Not	Berkshire		40
W. T. York	Mullen	Poland China		
A. M. Barker	Kemp's Mills	do		6
Z. S. Moffitt	Empire	B. Spanish		5
S. S. Cox	Brown	B. and P. China		10
Robeson County—				
W. G. McLean	Maxton	Berkshire	3	7
J. H. McKay	do	Duroc Jersey and Poland China.		
Rockingham County—				
R. A. Stokes	Ruffin	Berkshire	1	12
Rowan County—				
J. M. Harrison	Millbridge	Berkshire, Chester, W		
W. T. Shoemaker	Cleveland	Berkshire		
John Huston	Bear Poplar	Duroc-Jersey		
Charlie Wortham	Cleveland	Poland China		
E. F. Eaton	do	Chester, White		
Samuel Bame	Garfield	Poland China	2	20
James G. Arey	Lisk	Chester, White		6

SWINE REGISTER—Continued.

Name of Owner.	Post-office Address.	Name of Breed.	No. Registration.	No. Entitled to Registration.
Rutherford County—				
Will Brittain	Rutherfordton	Berkshire	2	
Stokes County—				
S. A. Moir	Francisco	Poland China		
Dr. A. Jones	Pulp	Berkshire		
R. J. Petree	Germanton	O. I. C		
L. W. Blackwell	Pine Hall	Poland China		
C. F. Lewis	Mizpah	Berkshire		2
I. G. Ross	Wilson's Store	Duroc-Jersey		
Surry County				
A. Chatham	Elkin	Berkshire	2	10
H. G. & R. M. Chatham	do	Berkshire, P. China	2	20
S. P. Gilbert	do	Chesters	2	8
J. H. Armstrong	Forge	Duroc-Jersey	1	
Swain County—				
A. M. Fry	Bryson City	Berkshire		
Heck Ditmore	do	do		
John Truett	Needmore	do		
D. F. Collins	Bryson City	Poland China		10
Wake County—				
J. D. Whitaker	Raleigh	Berkshire	40	7
I. M. Proctor	do	do	1	7
State Prison	do	do		
State Insane Hospital	do	do		
A. and M. College	West Raleigh	do		
Warren County—				
Walter Fleming	Warrenton	Berkshire, Chester	20	18
Do	do	O. I. C	2	5
Watauga County—				
C. S. Farthing	Hattie	Berkshire		
Wayne County—				
A. L. Sasser	Goldsboro	Poland China		1
John Davis	do	do	1	8
J. L. R. Dickinson	Fremont	Berkshire		10
Robt. Kornegay & Son	Mt. Olive	Poland China		10
Yancey County—				
A. A. Moody	Elmer	Poland China		7

HORSE AND JACK REGISTER.

Name of Owner.	Post-office Address.	Name of Breed.	No. Registrated.	No. Entitled to Registration.
Alamance County—				
L. Banks Holt	Graham	Standard	11	10
Do	do	Shetland Ponies		80
Alleghany County—				
Cheek & Transon	Montland	Spanish Jack		
G. T. Caudle	Montland	do		
D. R. Edwards	Edwards X Roads	Jack		
Burke County—				
James Harbison	Morganton	Spanish Jack		12
Caldwell County—				
Columbus Coffey	Patterson	Spanish Jack		
Carteret County—				
B. B. Chadwick	Straits	Banker Ponies		
G. W. Gaskill	do	do		
O. C. Whitehurst	do	do		
S. Harker	do	do		
E. Gilliken	do	do		
B. Gilliken	do	do		
Catawba County—				
R. L. Shuford	Newton	Jacks		
Cherokee County—				
Harling Thrash	Coalville	Jacks		
Clay County—				
W. H. Crawford	Clarence	Standard		1
Do		Spanish Jack		1
R. N. Penland	Elf	Jack		
Columbus County—				
John D. Strauss	Bolton	Spanish Jack		
Davidson County—				
W. T. Kendall	Thomasville	Span. Jacks, Jennies	2	2

HORSE AND JACK REGISTER—Continued.

Name of Owner.	Post-office Address.	Name of Breed.	No. Registered.	No. Entitled to Registration.
Davidson County—Con.				
G. H. Yow	Thomasville	Standard		
Holt Farm	Linwood	Spanish Jack		
Edgecombe County—				
John L. Cherry & Bro	Coakley	Thoroughbreds	4	7
Franklin County—				
Hayes & Fuller	Louisburg	Jack		
Gaston County—				
R. L. Abernethy	Mountain Island	Standard		5
Gates County—				
Willis Savage	Sunsbury	Jacks		
Mecklenburg County—				
J. A. Newell	Newell	Standard		
Do	do	Jacks		
Davidson Craig	Charlotte	Standard		
Pender County—				
D. L. Farrior	Maple Hill	Standard	17	9
Randolph County—				
K. G. Coultrane	Center	Jacks and Jennies		
Rowan County—				
J. M. Harrison	Millbridge	Norman		
Rutherford County—				
Ed. Thompson	Cliffdale	Jacks		5
Jake Carpenter	Logan's Store	do		
Surry County—				
H. G. & R. M. Chatham	Elkin	Standard		8
Swain County—				
J. H. Everett	Bryson City	Spanish Jack		
Warren County—				
J. B. Davis	Warren Plains	Standard	1	
Do	do	Spanish Jack	1	
Yancey County—				
A. A. Moody	Elmer	Spanish Jack	1	
Gilbert Wilson	Cane River	do	1	
W. M. Wilson	Bald Creek	do	1	
Will Higgins	Wampler	do	1	

SHEEP AND GOAT REGISTER.

Name of Owner.	Post-office Address.	Name of Breed.	No. Registered.	No. Entitled to Registration.
Alamance County—				
Holt & Homewood	Burlington	Shropshire		60
Alleghany County—				
Wm. Woodruff	Sparta	Shropshire		
Cheek & Transon	Montland	Merino		
S. A. Choat	Sparta	Shropshire		
E. C. Edwards	Edwards X Roads	Southdown		
R. F. Edwards	Hooker	Shropshire		
H. F. Jones	Sparta	do		28
Ashe County—				
John Dent	Jefferson	Shropshire	1	50
Mrs. J. Y. Neal	do	do		60
J. R. Perkins	Helton	do	12	
Young Bros	Vernon	Hampshire	25	
John F. Jones	Grassy Creek	Shropshire	1	6
T. D. Jones	do	do		
S. G. Parsons	do	do		
Wint Osborn	Sturgills	do		
D. Pennington	do	do		
Buncombe County—				
George W. Vanderbilt	Biltmore	Southdown	32	
J. E. Lytle	Arden	do		
Caldwell County—				
C. D. Coffey	Collettsville	Angora	3	
Catawba County—				
Jno. W. Rabon & Son	Hickory	Southdown		10
Cherokee County—				
J. E. Dickey	Ranger	Southdown		30

SHEEP AND GOAT REGISTER—Continued.

Name of Owner.	Post-office Address.	Name of Breed.	No. Registered.	No. Entitled to Registration.
Clay County—				
W. T. Bumgarner	Hayesville	Southdown	2	5
D. B. Kelvin	do	do		6
Thomas Phillips	do	do		8
A. D. Evans	Tusquitte	do		20
Columbus County—				
John D. Straus	Bolton	Cashmere Goats		1
Craven County—				
Tim. McCoy	Cove	Cotswold		20
Davidson County—				
Holt Farm	Linwood	Southdown		23
Edgecombe County—				
Jno. L. Cherry & Bro	Coakley	Southdown		
Gaston County—				
Moses Stroup	Bessemer City	Cotswold		
R. L. Abernethy	Mountain Island	Downing		
Granville County—				
W. L. Taylor	Bullock	Southdown		
J. J. Davis	Stovall	do		
Haywood County—				
M. J. McCracken	Crab Tree	De'aine	1	13
J. McD. Michal	Springdale	Southdown		
James M. Gwyn	do	do		
W. J. Haynes	Waynesville	do		
J. McD. Michal	Springdale	do		
J. M. L. McCracken	Peru	Rambouillet	8	10
Henderson County—				
Westfeldt Bros	Fletcher	Southdown	4	20
Jackson County—				
John Cogdill	Alice	Southdown		50
Macon County—				
J. H. Slagle	Franklin	Shropshire	1	
Mecklenburg County—				
R. G. Miller	Charlotte	Southdown		
James T. Kell	Fort Mill	do		12
Mitchell County—				
Col. Newson	Cranberry	Rambouillet		
J. G. Phillips	Ingalls	do		
T. J. Burleson	Clarissa	Cotswold		
Orange County—				
J. S. Carr	Durham	Shropshire		
Pender County—				
D. L. Farrior	Maple Hill	Shropshire		3
Randolph County—				
J. M. Williams	Liberty	Cotswold		
Alfred Jones	Mullen	Southdown		
G. E Stanton	Level Cross	Shropshire		1
Rockingham County—				
A. L. French	Fitzgerald	Shropshire	12	10
Stokes County—				
J. H. Sparks	Vade Mecum	Angora Goats		
Surry County—				
H. G. & R. M. Chatham	Elkin	Southdown, Oxfords	4	40
Warren County—				
W B. Fleming	Warrenton	Oxford, Southdown	1	10
Watauga County—				
James Horton	Vilas	Shropshire	6	
George Caudell	Valle Crucis	Angora Goats	19	
C. S. Farthing	Hattie	Shropshire		
W. E Shipley	Valle Crucis	do	10	
Yancey County—				
A. A. Moody	Elmer	Rambouillet	7	

SECOND REPORT ON FOOD PRODUCTS FOR 1901—GENERAL STATEMENT AND SUMMARY OF RESULTS.

BY B. W. KILGORE, STATE CHEMIST.

The General Assembly of the State passed what is generally known as the "Pure Food Law" in February, 1899. This law went into effect on the first day of August, of the same year. The first report on the examination of food products under this law was made in the *Bulletin* of the Department for December, 1900. The results of the second year's work are presented on the following pages. For the benefit and information of those who are interested in and not familiar with the law, it is thought well to again reproduce it in full:

AN ACT TO PREVENT THE SALE OF ADULTERATED AND MISBRANDED FOOD.

The General Assembly of North Carolina do enact:

SECTION 1. That for the purpose of protecting the people of the State from imposition by the adulteration and misbranding of articles of food, the Board of Agriculture shall cause to be procured from time to time, and under rules and regulations to be prescribed by them, in accordance with Section 9 of this Act, samples of food, beverages and condiments offered for sale in the State, and shall cause the same to be analyzed or examined microscopically or otherwise by the chemists, or other experts of the Department of Agriculture. The Board of Agriculture is hereby authorized to make such publications of the results of the examinations, analyses and so forth as they may deem proper.

SEC. 2. That no person, by himself or agent, shall knowingly manufacture, sell, expose for sale, or have in his possession, with intent to sell, any article of food which is adulterated or misbranded within the meaning of this Act; and any person who shall violate any of the provisions of this Act shall be guilty of a misdemeanor, and for such offense shall be fined not exceeding two hundred dollars for the first offense, and for each subsequent offense not exceeding three hundred dollars, or be imprisoned not exceeding one year, or both, in the discretion of the Court; and such fines, less legal costs and charges, shall be paid into the treasury of the State for the benefit of the Department of Agriculture, to be used exclusively in executing the provisions of this Act.

SEC. 3. That the chemists or other experts of the Department of Agriculture shall make, under rules and regulations prescribed by the Board of Agriculture, examinations of specimens of food, beverages and condiments offered for sale in North Carolina, which may be collected from time to time under their directions in various parts of the State. If it shall appear from such examination that any of the provisions of this Act have been violated, the Commissioner of Agriculture shall at once certify the facts to the proper

solicitor, and furnish that officer a copy of the result of the analysis duly authenticated by the analyst under oath.

SEC. 4. That it shall be the duty of every solicitor to whom the Commissioner of Agriculture shall report any violation of this Act, to cause proceedings to be commenced and prosecuted without delay for the fines and penalties in such cases provided.

SEC. 5. That the term "food" as used herein shall include all articles used for food—candy, condiment or drink, by man or domestic animals, whether simple, mixed or compound. The term "misbranded" as herein used shall include all articles of food or articles which enter into the composition of food, the package or label of which shall bear any statement purporting to name any ingredients or substances as being contained or not being contained in such article, which statement shall be false in any particular.

SEC. 6. That for the purpose of this Act an article of food shall be deemed adulterated—

First. If any substance or substances has or have been mixed or packed with it, so as to reduce or lower or injuriously affect its quality or strength so that such product when offered for sale shall deceive or tend to deceive the purchaser.

Second. If any inferior substance or substances has or have been substituted wholly or in part for the article so that the product, when sold, shall deceive or tend to deceive the purchaser.

Third. If any valuable constituent of the article has been wholly or in part abstracted so that the product, when sold, shall deceive or tend to deceive the purchaser.

Fourth. If it be an imitation of, and sold under the specific name of another article.

Fifth. If it be mixed, colored, powdered, coated, polished or stained in a manner whereby damage or inferiority is concealed, so that such product, when sold, shall deceive or tend to deceive the purchaser.

Sixth. If it contain any added poisonous ingredient, or any ingredient which may render such article injurious to the health of the person consuming it.

Seventh. If it be labeled or branded so as to deceive or mislead the purchaser, or purport to be a foreign product when branded so, or in an imitation either in package or label of an established proprietary product, which has been trade-marked or patented.

Eighth. If it consists of the whole or any part of a diseased, filthy, decomposed or putrid animal or vegetable substance, or any portion of an animal unfit for food, whether manufactured or not, or if it is the product of a diseased animal or of an animal that has died otherwise than by slaughter.

Ninth. That candies and chocolate may be deemed to be adulterated if they contain terra alba, barytes, talc, chrome yellow, or other mineral substances, or poisonous colors or flavors, or other ingredients deleterious or detrimental to health: *Provided*, that an article of food, beverage, or condiment which does not contain any added poisonous ingredient shall not be deemed to be adulterated in the following cases:

First. In the case of articles, mixtures or compounds which may be now, or

from time to time hereafter, known as articles of food, beverages or condiments under their own distinctive names, and not included in definition fourth of this section.

Second. In the case of articles labeled, branded or tagged so as to plainly indicate that they are mixtures, compounds, combinations, imitations or blends.

Third. When any matter or ingredient has been added to the food, beverage or condiment because the same is required for the production or preparation thereof as an article of commerce, in a state fit for carriage or consumption, and not fraudulently to increase the bulk, weight or measure of the food, beverage or condiment, or conceal the inferior quality thereof: *Provided*, that the same shall be labeled, branded or tagged as prescribed by the Board of Agriculture, so as to show them to be compounds and the exact character thereof: *And provided further*, that nothing in this act shall be construed as requiring or compelling proprietors or manufacturers of proprietary foods to disclose their trade formulas except in so far as the provisions of this act may require to secure freedom from adulteration or imitation: *Provided further*, that nothing in this act shall be construed to apply to propietary or patent medicines.

Fourth. Where the food, beverage or condiment is unavoidably mixed with some harmless extraneous matter, in the process of collection or preparation: *Provided further*, that no person shall be convicted under the provisions of this act when he is able to prove a written guaranty of purity in a form approved by the Board of Agriculture, as published in their rules and regulations, signed by the wholesale jobber, manufacturer or other party from whom he purchased said article.

SEC. 7. That the Board of Agriculture is hereby authorized to cause all compound, mixed or blended products to be properly branded and prescribe how this shall be done.

SEC. 8. That it shall be the duty of the Board of Agriculture to prepare and publish from time to time lists of the articles, mixtures or compounds declared to be exempt from the provisions of this act in accordance with Section 6. The Board of Agriculture shall also from time to time fix and publish the limits of variability permissible in any article of food, beverage or condiment, and these standards when so published shall remain the standards before all Courts: *Provided*, that when standards have been or may be fixed by the Secretary of Agriculture of the United States, they shall be accepted by the Board of Agriculture and published as the standards of North Carolina.

SEC. 9. That every person who exposes for sale or delivers to a purchaser any condiment, beverage or article of food, shall furnish, within business hours, and upon tender and full payment of the selling price, a sample of such condiments, beverages or articles of food to any person duly authorized by the Board of Agriculture to secure the same and who shall apply to such manufacturer or vender or person delivering to a purchaser such beverage or article of food, for such sample for such use in sufficient quantity for the analysis of such article or articles in his possession.

SEC. 10. That any manufacturer or dealer who refuses to comply upon de-

mand with the requirements of Section 9 of this act, or any manufacturer, dealer or person who shall impede, obstruct, hinder or otherwise prevent or attempt to prevent any chemist, inspector or other person in the performance of his duty in connection with this act, shall be guilty of a misdemeanor, and shall, upon conviction, be fined not less than ten dollars nor more than one hundred dollars, or be imprisoned not more than one hundred days, or both, in the discretion of the Court, and said fines, less the legal costs, shall be paid into the treasury of the State for the benefit of the Department of Agriculture, to be use exclusively in executing the provisions of this act.

SEC. 11. That this act shall not be construed to interfere with commerce, or any interstate commerce laws of the United States.

SEC. 12. That chapter one hundred and twenty-two, Public Laws of one thousand eight hundred and ninety-five, be and the same is hereby repealed.

SEC. 13. That this act shall be in force from the first day of August, one thousand eight hundred and ninety-nine.

Ratified the 13th day of February, A. D. 1899.

DUTIES OF THE DEPARTMENT UNDER THE FOOD LAW.

This law either authorizes or directs the Board of Agriculture:

1. To collect and make examination of food and drink for man and beast, and publish the results. (Sec. 1.)
2. When adulteration, misbranding, or other violation is evident, the facts are to be certified to the proper Solicitor, who shall prosecute without delay for fines and penalties. (Secs. 3 and 4.)
3. To cause all mixed, compound, or blended products to be properly branded, and to prescribe how this shall be done. (Sec. 7.)
4. To fix standards of strength, quality and purity. (Sec. 8.)
5. To publish list of articles exempt from the provisions of the act.

STANDARDS AND RULINGS OF THE BOARD OF AGRICULTURE RELATING TO FOOD UNDER THE PURE FOOD LAW.

Rulings have been made regarding the subject of branding or labeling and preservatives, and a form of guarantee provided as required in Section 6 of the law. Standards have been fixed for a considerable number of food products. Others will be made later. The following subjects have been covered, and the attention of merchants is especially called to these rulings and standards:

Vinegar.—To be standard, vinegar shall contain not less than four per cent of acetic acid. When of less strength, the percentage of acetic acid must be branded on every package in which it is sold, exposed, or offered for sale. Vinegar must not contain any preparation of lead, copper, sulphuric acid, or other ingredient injurious to health, and when artificially colored the fact shall be made known by a proper label (as designated under paragraph on Labeling) attached to every package in which it is sold, exposed or offered for sale.

Apple Cider, or Orchard Vinegar, must be made from the pure juice of apples, free from foreign substances, and must contain not less than 1½ per cent of apple cider solids.

Other Vinegars must be sold under names which represent truly the material or materials from which they are severally made, as "Malt Vinegar," "Grape Vinegar."

All fermented and not distilled vinegars must contain not less than 1½ per cent of the solids of the grains or fruits from which they are made.

Distilled Vinegar must be labeled and sold as such.

Milk.—Milk must be from healthy cows and must contain at least 12 per cent of total solids and 3 per cent of butter fat, unless labeled or sold as "skimmed milk," or milk below standard. Coloring matter or preservatives must not be added unless the cans from which the milk is sold are conspicuously labeled to show such addition, and written notice is served on each customer stating the kind and amount of coloring matter or preservative, or both, used to the gallon.

Butter.—Butter must contain not less than 80 per cent of milk fat, without admixture of any other animal or vegetable fats.

Process Butter.—Deteriorated or unmarketable butter, which by any process or remelting or working over has been made marketable, must be branded and sold as "*Process Butter*," and each package so sold, offered or exposed for sale must be labeled so as to fairly and clearly furnish this information.

Oleomargarine.—Oleomargarine, butterine and kindred mixtures of animal and vegetable fats, or mixtures of these with butter, must be sold under their own distinctive names, as Oleomargarine or Butterine, and each package so sold, offered or exposed for sale must be so labeled (as prescribed under paragraph headed "Labeling") as to furnish clearly and fairly this information.

Cheese.—Cheese not made wholly from pure, unskimmed milk or cream must be sold as "Skim-milk Cheese," and where other fats have been added, it must be sold as "Filled Cheese," and each cheese must be so labeled as to furnish this information, as directed under the labeling paragraph.

Lard.—Lard is the rendered fat of swine, and should contain not less than 99 per cent of this fat. Other fats and oils, and mixtures of them, must be sold under their true name or coin names, or as "lard substitutes." An admixture of other fat or fats with a considerable percentage of lard may be sold as "lard compound," otherwise it must be sold as adulterated lard.

Oils.—Oils, as olive and cotton seed, must be sold under their true names, or under names that will not mislead as to their true character; and when mixed or blended the fact shall be made known by proper and conspicuous labeling on the containing vessels; otherwise they must be branded and sold as "adulterated."

Spices and Peppers.—Spices and peppers must be pure and true to name, and must not be mixed with other substances or with exhausted or impure articles of their own kind, unless labeled and sold as adulterated.

Mustard.—Dry mustard must be pure. Mixtures of mustard, vinegar and spices may be sold as "Prepared Mustard," but must not be diluted with starch or other materials, unless the fact is made known on the label.

Ciders and Fruit Juices.—These must be made of unadulterated fruit juices, and be sold under the name of the fruit from which made. No pre-

servative, color or flavor shall be added, unless the fact is made known by proper label attached to each package. When artificially colored or flavored, or both, they must be sold as "adulterated" or "imitation" products, in which case any added preservative must be made known by proper label.

Beers and Wines and other Alcoholic and Non-Alcoholic Drinks and Products used in making such must not contain added preservatives, coloring, or flavor, unless the fact is made known by proper label on each package. When made partly or entirely from artificial products, they must be sold as "adulterated" or "imitation" products, any added preservative being made known on proper label.

Cereal and Farinaceous Products.—Flour, cracked and rolled wheat, oats, buckwheat, barley and corn, and their products, rice, etc., must be true to name, and when mixed with each other or with other vegetable or mineral products, the mixtures must be sold under coin names or as mixtures or compounds.

Canned Goods.—Canned goods must be true to name and be free from added coloring, flavor or preservatives, unless such addition or additions are made known by conspicuous labeling.

Candy.—Candy must not contain terra alba, kaolin, or other mineral substances or harmful coloring or other matter.

Fruit Jellies, Butter, Jams, Preserves, Conserves, Confections and like articles must be made entirely of the fruit specified on the label and preserved only with cane sugar, and must not contain any artificial coloring, preservatives or flavor, except spices or other wholesome natural flavoring materials, unless such added flavors, coloring and (or) preservatives are made known on the labels. When made partly or wholly of artificial materials, or when any material to make up bulk or weight, to add flavor or color, except as indicated as above, have been used, the products must be sold as "adulterated" or "imitation" products, in which case any added preservatives must be made known on the label.

Honey must not have added to it directly by man, or indirectly by feeding to the bees, glucose, cane sugar, invert sugar, or other matter not naturally occurring in pure honey, unless sold as adulterated honey, or a statement regarding the adulteration is made a part of the label attached to each package sold.

Coffee.—Coffee must be true to name and of full strength. It must not be mixed with exhausted or partially exhausted coffee, or any other substance or substances, except as indicated below. If mixed with chicory or other harmless substitute allied to coffee in either flavor or strength, and not used simply as an adulterant, the mixture may be sold as "Coffee Compound."

Imitations or substitutes containing no coffee must not be sold as coffee compounds, but may be sold under coin names.

Tea.—Tea, when sold, exposed or offered for sale as such, must consist wholly of the dried leaves of the true tea plant, without artificial color, filler or extraction of essential properties, unless conspicuously labeled as "adulterated."

Baking Powders.—Baking powders must not contain substances not necessary to their manufacture, and they must be labeled in a conspicuous way

and place, either in the name of the powder itself, or elsewhere, so as to show the acid salt of which the powder is made, as "Alum baking powder," "Alum-phosphate baking powder," "Phosphate baking powder," or "Cream of tartar baking powder," and when so labeled they must be true to label.

Preservatives.—The term preservative is considered synonymous with antiseptic. Food containing any added antiseptic or preservative substance or substances, except common table salt, saltpeter, cane sugar, alcohol, vinegar, spices, or the natural products of the smoking process, shall have the presence of such preservative or preservatives made clearly known by conspicuous labeling, or made known to purchasers when the article is not capable of being labeled.

Labeling.—A label must be, as far as possible, attached to each package, and contain, in addition to other information, the name and address of the manufacturer or jobber. When the words "artificial," "imitation," "compound," "adulterated," or words of similar import are required, they must immediately precede or follow the word or words they modify, and be in the same size and style of type and on the same kind of background as the word or words with which they are closely associated.

Where the presence of preservatives, coloring matter or other substance or substances is required to be printed on the label, as indicated in the several paragraphs relating to different food products, the printing must be done clearly and conspicuously on the label in type not smaller than *brevier heavy gothic caps*, and on the same kind of background as the rest of the label.

FORM OF GUARANTY OF PURITY APPROVED BY THE BOARD OF AGRICULTURE, AS PROVIDED FOR IN SECTION SIX OF THE PURE FOOD LAW.

I (or we), the undersigned wholesaler, jobber, or manufacturer, in consideration of (name and address), retail merchant, purchasing food from us, hereby guarantee that all food sold to .... shall be pure within the meaning of what is known as the Pure Food Law (An Act to Prevent the Sale of Adulterated and Misbranded Food, ratified the 13th day of February, 1899), and shall conform with the requirements of said law and the Standards and Rulings of the Board of Agriculture as regards standards of quality, branding, and otherwise. This guaranty to remain in force till revoked in writing.

The article referred to in this guaranty is (or are) ....
....

(Signed ....

Address ....

Date ....

GENERAL STATEMENT.

The Department of Agriculture desires the co-operation and support of manufacturers, jobbers, wholesalers, retailers and individuals in carrying out the provisions of the Pure Food Law. To this end the Department

(1) Invites suggestions and will give hearings to interested parties regarding the present Standards and Rulings, others that may seem desirable, or that may be made in the future.

(2) Analyses will be made for parties within the State when samples are taken in accordance with instructions furnished by the State Chemist and the required data concerning the samples are given.

(3) Analyses will be sent to parties sending samples, and to parties from whom samples are taken by the Department. It is the desire of the Department to put information into the hands of manufacturers, dealers and users of food, and to assist them in every way it can to know and to manufacture, handle and use the best, most desirable and most wholesome food products. The Pure Food Law is in the interest of the honest manufacturer, the honest dealer, and for the protection of the consumer. It should operate in this way.

SAMPLES EXAMINED IN 1901.

In our first report of the examination of food products (for 1900) the results of the analyses of something over five hundred samples were included, and the amount of adulteration was shown to be very large—56 per cent of the materials examined being in some way sophisticated.

Three hundred and eight samples of food products were collected by an agent of the Department and analyzed chemically and microscopically during 1901.

These samples were obtained, in the numbers indicated, from the following towns in the State:

PLACES AT WHICH SAMPLES WERE OBTAINED, AND NUMBER OBTAINED AT EACH PLACE.

Edenton	1
Enfield	1
Goldsboro	30
Greensboro	12
Greenville	43
Hickory	19
Kinston	24
Montreat	1
New Bern	48
Raleigh	42
Shelby	1
Statesville	16
Washington	27
Wilson	43
Total	308

KIND AND NUMBER OF SAMPLES ANALYZED.

Baking Powders	85
Coffee	55
Condiments (Peppers, Spice, Ginger, Nutmeg, etc.)	44
Jams, Fruit Butters and Preserves	25
Jellies	10

Molasses, Syrups and Honey	32
Sugar	19
Tea	25
Vinegar	13
Total	308

SUMMARY OF RESULTS.

A summary statement of the results of the examination of the 308 samples of food products in 1901 is furnished in the table below. It shows the total number of foods of each kind analyzed, the number found adulterated, and the percentage of adulteration. Of the 308 samples, 110, or 35.7 per cent, were found to be in some way sophisticated. The percentage of adulteration in 1900 was 56 per cent of all the samples examined. The products inspected and analyzed in 1900 were largely of different kinds from those presented in this report. Jellies, jams, fruit butters, preserves, molasses, honey and syrups are the subjects of the greatest amount of adulteration. In fact, nearly all of these products were in some way mixed with other materials or were wholly imitative products.

The amount of deception in the foods sold in the State is great enough to justify an extension of this work. We are glad to say, however, that some of the manufacturers are seeking information as to our law, standards and rulings, and expressing a desire to make their products comply with all requirements. In this way, and through the distribution of information regarding the brands of adulterated foods in our food reports, a great deal of good has already been done in an educational way—the very best way—and a foundation laid, we feel, for a gradual bettering of the food products on our markets.

SUMMARY OF RESULTS OF THE EXAMINATION OF FOOD PRODUCTS.

	Total Number Samples.	Not Found Adulterated.	Found Adulterated.	Per Cent Adulterated.
Baking Powders	85	69	16	18.8
Coffee	55	35	20	36.3
Condiments	44	35	9	20.4
Jams, fruit butters and preserves	25		25	100
Jellies	10		10	100
Molasses, syrups and honey	32	6	26	81.2
Sugar	19	19		
Tea	25	25		
Vinegar	13	9	4	30.7
Total	308	198	110	35.7

On the following pages are detailed the results of the analyses of the several classes of foods, credit being given in each case to the chemists who did the laboratory work.

BAKING POWDERS.

BY W. M. ALLEN AND F. C. LAMB.

The aeration or leavening of bread is accomplished by an evolution, through the whole mass of dough, of carbon dioxide gas, which in escaping makes the baking bread light and porous, and thus of easy access to the digestive fluids of the body. Most of the gas is generated before the process of baking begins, but is largely clogged in the mass, the heat causing the gas to expand and do its work more effectively. The two principal means of producing the carbon dioxide gas are yeast and baking powders.

By the use of yeast there is introduced into bread minute plants, which bring about the fermentation of the sugars already present in the dough and those formed while standing, with the production of alcohol and carbon dioxide, both of which largely, if not entirely, escape during the baking process.

Taking everything into consideration, nothing has ever been found that equals yeast as a leavening agent. With it carbon dioxide gas is generated by fermentation from the constituents already existing in the bread, so that no foreign materials are introduced into it. The organisms, or microscopic plants, are killed in the baking, and nothing harmful is left in the bread.

In so far as the quality of the bread is concerned, there is no method that will approach this natural process. However, it must be said that this means of leavening is at a slight loss of bread, as the carbon dioxide gas, which does the work, and the alcohol which is produced at the same time, come from the decomposition of sugar and starch, at the expense of the constituents of the flour, and, of course, to that extent, which is very small, lessens the amount of bread produced from a given quantity of material. But what is lost in the quantity is gained in the quality of the bread. The disengaging of the gas takes place slowly, so that it is lodged in the dough, and has its full effect in the lightening of the bread. This is one objection to its use when quick raising is desired.

It is the slow action of yeast which has been the chief cause of the introduction of chemical aerating materials. In all of these carbon dioxide gas is the active agent, as is the case when yeast is employed. But instead of its being derived from the constituents of the flour, it is obtained by the decomposition of a carbonate, which is introduced, together with an acid constituent, to set the gas of the carbonate free.

The substance used to furnish the carbonic acid gas is almost exclusively bicarbonate of soda (common baking or cooking soda), which is made up of about 52 per cent of the gas sought. There is more diversity in the acid constituents employed, the main ones being tartaric acid, cream of tartar, acid phosphate of lime and the alums. Baking powders are classified according to the acid-furnishing material used with the soda.

A knowledge of these acid materials and the residue left after their reacting with the bicarbonate of soda, is essential to a proper understanding of the value and wholesomeness of the baking powders they compose.

The residue left in the bread is the main objection to the use of baking powders, its amount and character determining, to a large extent, the healthfulness of the particular powder.

The efficiency of a baking powder as a leavening agent depends on the amount of gas it sets free in the dough, and must be considered apart from the wholesomeness of the residue it leaves.

Filling.—The presence of a material that is harmless, such as flour or starch, in a baking powder of good leavening power, say ten per cent or over of available dioxide, could not be considered an adulteration, but an ingredient necessary for the keeping of the powder. It is claimed that such is not necessary, if the powder is put up properly, in a dry climate.

Small amounts of sulphate of lime (gypsum) are almost unavoidably introduced into phosphate and alum-phosphate powders, as an impurity of the acid phosphate. This material is sometimes separately added as filler. It is but slightly soluble in water, and while not toxic, is undesirable in food products.

Other very finely ground and objectionable mineral substances, which will be referred to specifically in this report, are also used as filler. Filling materials are often added at the expense of the quality of the powder, and are then adulterants, even when they are legitimate in character.

CLASSIFICATION OF BAKING POWDERS.

Baking powders may be classified according to the acid constituents they contain, as follows:

Tartaric powders, in which the acid is tartaric acid in some form.

Phosphate powders, in which the acid is phosphoric acid.

Alum powders, in which the acid is sulphuric acid, contained in some form of alum salt.

Alum-Phosphate powders, in which the acid is both sulphuric and phosphoric acids.

TARTARIC ACID BAKING POWDERS.

Tartaric acid is a crystalline substance, readily soluble in water. It is the principal acid in grapes, and is contained in all grape wines. It is prepared from the settlings of wine casks, known as argols.

The residue left in the bread prepared with tartaric acid powders is sodium tartrate, a salt that acts like and with the power of ordinary salts (Epsom salts*), though the amount left in a half dozen biscuits would only be about one-fortieth of a medicinal dose. The free acid is rarely used, though cheaper in proportion to the carbon dioxide gas set free, and leaves less residue. Being very soluble in water, it probably sets the gas free too rapidly, and would also be more liable to decompose the carbonate in damp atmosphere and cause a deterioration of the strength of the powder.

CREAM OF TARTAR BAKING POWDERS.

Cream of tartar, the name by which bitartrate of potash, or acid tartrate of potash, is known in commerce, is a colorless crystalline acid salt. It is not very readily soluble in water, and is made from crude argols by recrystallization.

*U. S. Dispensatory.

The residue left in the bread made with cream of tartar baking powder is the non-volatile compound, sodium-potassium tartrate, or Rochelle salts, which is a well-known purgative. A half dozen average biscuits would contain less than one-eighth of an average medicinal dose.

PHOSPHATE BAKING POWDERS.

The acid constituent of these powders is a purified acid phosphate of lime, sometimes called super-phosphate. The pure salt is known as monocalcic phosphate. It is obtained by the action of sulphuric acid on bone ash, ground bone or some other form of phosphate of lime, the result being an impure monocalcic phosphate, with calcium sulphate. It is, of course, purified for use in baking powders, but it is very difficult to get rid, entirely, of the calcium sulphate.

The residue left in bread by a phosphate powder is phosphate of lime, phosphate of soda, and calcium sulphate (where this latter is an impurity in the calcium phosphate used in making the powder). The form of phosphate of lime left in bread is almost insoluble in water, but soluble in dilute acids, and is, therefore, probably dissolved, to some extent, in the gastric juices of the stomach. It is not used in medicine.

Sodium phosphate is a crystalline salt easily soluble in water. In moderate doses it is a mild purgative and well adapted to persons with delicate stomachs.* A half dozen biscuits would contain less than one-twentieth of a medicinal dose.

ALUM BAKING POWDERS.

The acid material in alum powders is furnished by some one of the general class of salts known as alums, which are what are commonly known as double sulphates of aluminum and an alkali-metal. The acid in these is sulphuric acid, and the carbon dioxide is set free from the bicarbonate of soda by the substitution of sulphuric acid for the carbonic acid, the alumina being left as hydroxide.

Three of these alum salts are met with in the manufacture of baking powders, namely, potash alum, ammonia alum, and soda alum.

Formerly, potash alum was most largely used, but at present it has about disappeared and ammonia and soda alums are employed, together with sulphate of aluminum, in some cases.

"Alum is a powerful astringent, with decided irritant qualities, owing to which, when taken internally in sufficient quantity, it is emetic and purgative, and may even cause fatal gastro-intestinal inflammation."*

The residue left in bread from an alum powder is more complex than is the case with any of the other classes previously mentioned, and depends on the kind of alum used. As the carbonic acid in the bicarbonate of soda is replaced by sulphuric acid, sodium sulphate, of course, forms part of the residue. If soda alum is used, then the residue would be sodium sulphate (Glauber's salts), and aluminum hydroxide. If potash or ammonia alum is used, their respective sulphate would be present, in addition to aluminum hydroxide and sodium sulphate.

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*U. S. Dispensatory.

"Sodium sulphate in doses of from half an ounce to an ounce is an efficient hydragogue cathartic; in smaller doses an aperient and diuretic."*

Aluminum hydroxide is a white, light amorphous powder, odorless and tasteless. It is very feebly astringent and desiccant powder, in medicine sometimes used externally, but not internally."*

Potassium sulphate is a mild purgative, operating usually without heat, pain or other symptoms of irritation.*

Ammonium sulphate is not used in medicine except in other compounds.*

A half dozen biscuits made from an alum powder of good leavening power would contain about one-twentieth of an ounce of Glauber's salts and a small amount of aluminum hydroxide.

ALUM-PHOSPHATE BAKING POWDERS.

Besides those powders that contain one acid ingredient, there is a large class contains two, and sometimes even more, acid-furnishing materials. Of these, the alum-phosphate powders are the most common and important. They are mixtures of alum and phosphate powders, and, therefore, have materials furnishing both sulphuric and phosphoric acids.

The residue left in bread by alum-phosphate powder would be a mixture of the residues already referred to as being present in bread when alum and phosphate powders are used separately, with a small amount of aluminum phosphate in addition, and which is insoluble in water, but soluble in dilute hydrochloric acid, and, therefore, presumably at least, slightly in the digestive fluids. It is not used in medicine.

On account of the variable composition of alum-phosphate powders, no satisfactory estimate can be made of the amount of salts left in the bread.

GENERAL REMARKS.

All baking powders, without exception, leave in the bread after baking certain salts, previously mentioned, which are foreign to the flour, and most of which are used in medicine, though some of them not internally. It stands to reason that were it not for convenience, the introduction into foods of these salts would be condemned, because of their effects on the system. As a whole, they are not generally consided unwholesome, but are open to certain objections, because they introduce into bread salts having a decided medicinal effect. It would appear that alum powders are much more likely to be injurious than any of the others commonly used, because of the physiological effect of alum (some of it may be left as such in bread) and the products resulting from its decomposition in the bread-making process.

Much interesting discussion has been and is now going on regarding the several classes of baking powders and the advantages possessed by each. Wide and honest difference of opinion exists as to the comparative wholesomeness of the different kinds of powders. With each kind of powder labeled and sold for what is really is (which is required by the regulations published in this report) each individual can protect himself and family when his mind is mature on the subject.

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* U. S. Dispensatory.

EXAMINATION OF BAKING POWDERS SOLD IN NORTH CAROLINA.

Eighty-five samples, representing forty different brands of baking powders, were purchased by an agent of the Department, in the towns and villages of the State.

Each of these, in which the carbonate and acid ingredients were mixed, except nine, were purchased in sealed tin cans, bearing on the label the brand name, name and address of the manufacturer, and directions for use.

Numbers 633, 634, 649 and 656 were in glass tumblers.

Numbers 626, 642, 671 and 691, which are Parrot and Monkey Powders, and 647, "Our Daisy," were in paper boxes, but were labeled as all the others. Horsford's, in which the carbonate and acid were not mixed, were purchased in paper packages, with name of brand, manufacturer and address and directions for mixing the carbonate and the acid ingredients.

Most of the samples were in good condition, the exceptions being referred to at other places.

Nearly all were guaranteed to be perfectly pure and to contain nothing detrimental to health; 65.50 per cent of the samples contained alum, though no statement to this effect was present on the cans or packages. Six out of nine brands of tartrate powders claimed on the label to be made of pure cream of tartar, and one, Number 633, made by the Virginia Chemical Company, claimed to be a tartrate powder, when, in fact, it is an alum powder, and does not contain tartaric acid or cream of tartar.

Both of two brands of phosphate powders claimed to be made of pure acid phosphate.

These samples were carefully analyzed. The determinations of most of the ingredients, especially the important ones, were made in duplicate, to be sure that they were correct.

The samples are classified according to the acid material present. The following is a summary on this basis:

Tartaric acid powders		0
Cream of tartar powders	No. of brands	5
	No. of samples	5
Cream of tartar-tartaric acid powders	No. of brands	4
	No. of samples	12
Phosphate powders	No. of brands	2
	No. of samples	12
Alum powders	No. of brands	18
	No. of samples	37
Alum-phosphate powders	No. of brands	11
	No. of samples	19
Total number of brands examined		40
Total number of samples examined		85

Cream of Tartar-tartaric Acid Powders.—All of these, except Nos. 644 and 673, have from fair to good leavening power (ten per cent and over of available carbonic acid). They contain a slight excess of sodium bicarbonate, from 9.92 to 12.42 per cent of carbon dioxide gas, sufficient starch for filling

and no calcium sulphate or other objectionable filler. The low leavening power of Numbers 644 and 673, judging from the amount of "soda" and tartaric acid present, was either due to very long standing or not being properly put up. These powders were sold at retail at 50 cents per pound.

Phosphate Powders.—All of these, except Numbers 625, 655 and 674, have fair to good leavening power.

In the Horsford's powders, calcium sulphate seems to have been used, together with starch, for filling. The calcium sulphate not being a food, and taking no part in the leavening power, is clearly an adulteration and should not be used. The retail price per pound was 15 to 40 cents.

Alum Powders.—Of this class of powders, eighteen brands and thirty-seven samples were examined. Eight are deficient in leavening power, Numbers 651 and 63 having less than one-tenth of a good leavening quantity of carbonic acid gas. A good many of them contain small amounts of calcium sulphate (gypsum) as impurity, either in the materials from which they were made, or else by direct addition as an adulterant. Numbers 621, 636 and 651 contain calcium sulphate in quantities that make it clearly an adulterant, and will be referred to under adulterated powders.

Others of these samples contain insoluble mineral matter that is also clearly an adulteration, and will be referred to later. These powders retail for from 6 2-3 to 26 2-3 cents per pound.

Alum-phosphate Powders.—Eight out of nineteen samples of this class of powders, or 42.1 per cent, are considerably deficient in leavening power, containing only 0.50 per cent to less than five per cent of available carbon dioxide gas. From the amount of soda and acid found in these powders, it appears that the carbonate has previously been decomposed, and the carbon dioxide lost, probably on account of the way they were mixed. A good many of them contain rather large amounts of starch as filler. Over thirty per cent of starch is not necessary or desirable.

On standing, baking powders, unless very carefully put up, gradually lose their leavening power, and the longer a powder stands, other things being equal, the lower will be the leavening power (carbon dioxide). For that reason, and on account of the variation in the analyses of the different samples, several samples of some of the brands were analyzed, and found to vary quite a good deal. If a powder is not put up dry and kept so, there will be a gradual decomposition or loss in leavening power. The carbon dioxide gas was carefully determined in duplicate and calculated to the sodium bicarbonate.

The alum was largely present as soda alum; though in a number of samples ammonia was found, showing the presence of ammonium alum, or ammonium carbonate, the latter not being likely. For the sake of uniformity, the alum was all calculated to the anhydrous soda alum.

ADULTERATED BAKING POWDERS.

The following baking powders are considered adulterated, and their sale in North Carolina is illegal:

No.	Brand.	Adulterant.	Per Cent.
621	Cream	Sulphate of Lime	6.08
636	Virginia Baking Powder	do	23.64
651	Defiance, One Spoon	do	33.36
638	Horsford's	do	
637	do	do	
663	do	do	
677	do	do	
655	do	do	
623	do	do	
674	do	do	
680*a*	Possum, Savannah Soda Works, Savannah, Ga	Talc and Tremolite	32.93
680*b*	do	do	*32.93
689	Hermitage, Mermitage Baking Powder Co., Nashville, Tennessee.	do	18.42
698	Sweetheart, Southern Soda Works, Nashville, Tenn	do	27.37
664	do	do	27.21
657	do	do	27.30

* A complete analysis was not made of 680*b*.

Number 63 was sold for a cream of tartar powder; it is an alum powder.

Of the eighty-five samples examined, 16 or 18.82 per cent, nearly one-fifth, are adulterated; ten with sulphate of lime, and six with ground white mineral, insoluble as strong acids. Microscopic examination of this mineral substance by Mr. C. D. Harris showed it to be ground talc or tremolite. The sharp needle-like crystals as they appear under the microscope are shown in a cut on another page. It is a dangerous admixture in food products.

METHODS OF ANALYSIS.*

CARBON DIOXIDE.

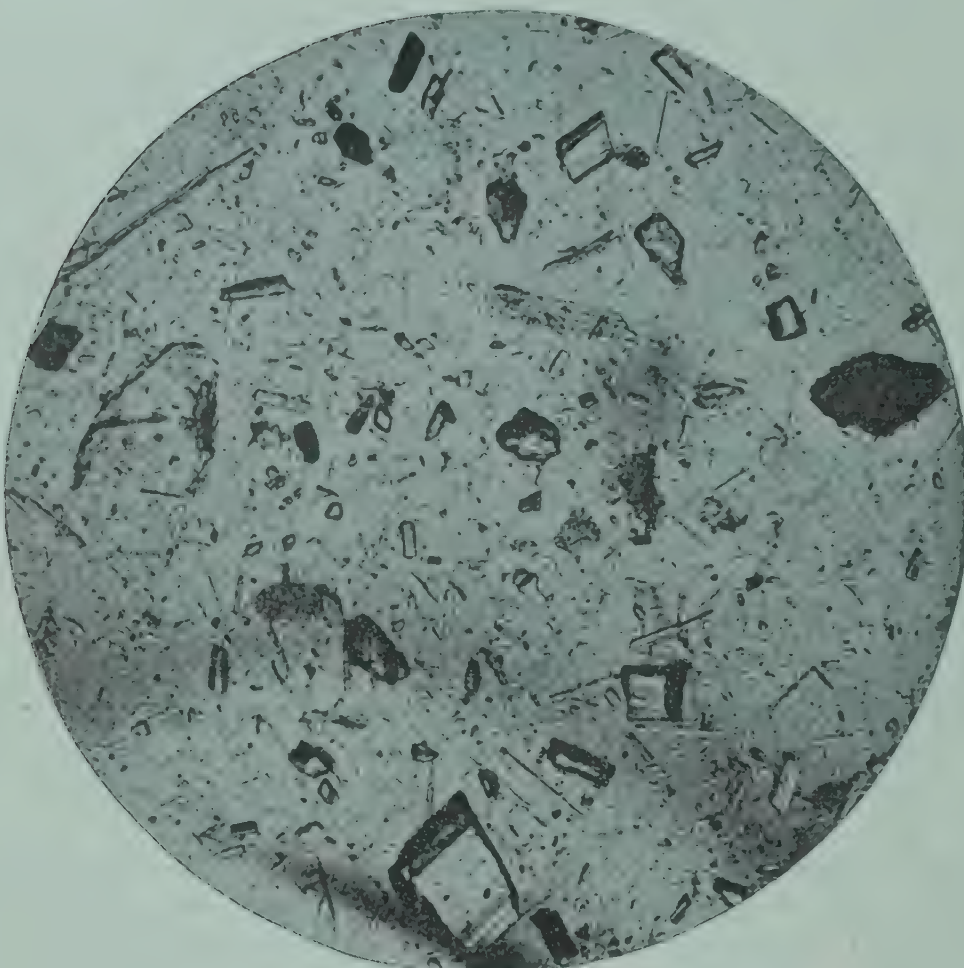
Total Carbon Dioxide.—The absorption method described by Fresenius and modified by Heidenhain was employed. A 10-per cent hydrochloric acid was used to liberate the gas. It was dried by calcium chloride and absorbed by potassium hydrate, in Geissler's potash bulb, and weighed. Duplicate determinations were made on each sample.

Residual Carbon Dioxide.—Methods described by McGill and Catlin were used for these determinations.

Place 2 grams of sample in flask suitable for the subsequent determination of carbon dioxide, add 20 c. c. of cold water and let stand twenty minutes.

Place the flask in a bath at the temperature of boiling water, and with occasional shaking, heat for twenty minutes. To complete reaction, heat quickly to boiling, and boil for one minute. Aspirate until air in flask is changed. Determine the residual carbon dioxide by method for total carbon dioxide.

*With slight changes in a few cases, these methods are the ones described by Winton in the Connecticut Experiment Station's Report on Food Products, pages 169, 174–180. 1900.



Photomicrograph showing appearance of ground mineral (talc and tremolite found in Hermitage, Sweetheart and Possum Baking Powders.

Can in which Possum Baking Powder was sold. It contained nearly 33 per cent of ground mineral.

Cans in which Hermitage Baking Powder was sold. It contained over 18 per cent of ground mineral.

Available Carbon Dioxide.—To obtain the available carbon dioxide, subtract the residual from the total.

STARCH.

Copper Reduction Method.—Place 5 grams of the baking powder in a graduated 500 c. c. flask, add 200 c. c. of 3 per cent hydrochloric acid and allow the mixture to stand for one hour with frequent shaking (McGill's Method). Filter on a Schleicher and Schnell, No. 589-12½ cm. diameter, or any filter that will give a clear solution. Rinse the flask without trying to remove all the starch, and wash the filter twice or three times with cold water.

Carefully wash the starch from the paper back into the flask with 200 c. c. of water, using a small wash bottle, and add 20 c. c. of 25 per cent hydrochloric acid. Heat for three hours on a boiling water bath to convert starch into dextrose (Sachsse's Method).

In the case of powders that are free from lime, heat the material directly with 200 c. c. of water and 20 c. c. of 25 per cent hydrochloric acid, omitting the treatment with cold 3 per cent acid.

Cool the solution, nearly neutralize with sodium hydrate solution, make up to 500 c. c. and filter through a dry paper. Determine reducing matters by Allihn's Method, as follows:

Cans in which Sweetheart Baking Powder was sold. It contained over 27 per cent of ground mineral.

Mix 30 c. c. of a solution containing 173 grams of Rochelle salt and 125 grams of caustic potash in 500 c. c. of water, and 30 c. c. of a solution of 34.69 grams of pure crystalized copper sulphate in 500 c. c. of water, in a beaker of 200 c. c. capacity and heat to boiling. To the boiling liquid, without delay, add 25 c. c. of the solution to be examined, and continue the heating until boiling begins again. After the reduced copper suboxide has settled, collect on an asbestos filter that has been thoroughly washed with strong hydrochloric acid, in a weighed Gooch crucible. Wash thoroughly with hot water, then once with cold water, once with about 15 c. c. of 95 per cent alcohol, and last with 10 c. c. of ether. Dry in a boiling water bath for 30 minutes, cool and weigh.

To obtain the weight of metallic copper, multiply the weight of the cuprous oxide by .888 and find the corresponding amount of dextrose in Allihn's tables. To obtain the corresponding weight of starch, multiply the weight of dextrose by 0.9.

TARTARIC ACID.

Goldenberg-Heidenhain Method.—Place in a beaker about six inches deep, 2 grams of the baking powder and sufficient potassium carbonate to combine with all the tartaric acid not combined with the potash as bitartrate. Mix thoroughly with 15 c. c. of water, add 99 per cent acetic acid from a graduated pipette until effervescence ceases, and in addition twice as much more as

was used for the neutralization. Mix by stirring for a half minute; add 100 c. c. of 95 per cent alcohol; stir violently for five minutes, and allow to settle at least thirty minutes. Filter on a Gooch filter of well-washed asbestos, and wash with 95 per cent alcohol, until 2 c. c. of the filtrate do not change the color of litmus tincture diluted with water. Wash the precipitate in a small casserole with about 50 c. c. of hot water and add standard potassium hydrate solution, but leaving it still acid. Boil for a minute. Finish the titration, using phenolphthalein as an indicator.

A small correction must be made, depending upon the strength of the standard solution. To find what the correction should be, titrate 5 grams of pure potassium bitartrate, and note the amount of standard alkali used. Treat .5 grams of the same bitartrate as the baking powder sample above and titrate with the same alkali. Subtract the latter amount from the former and it will give the proper correction to be made on titration of the sample. From the amount of standard alkali, calculate the amount of potassium bitartrate representing the total tartaric acid.

To find the free tartaric acid, determine the potash, calculate it to potassium bitartrate, subtract the latter amount from the amount of the total, and the difference calculated to tartaric acid will give the free acid present.

ALUMINA, IRON, LIME, POTASH AND SODA.

Preparation of Solution.—Char 5 grams of the baking powder in a platinum dish at a heat below redness. Boil the mass with dilute hydrochloric acid; filter into a graduated 500 c. c. flask and wash with hot water. Return the residue, together with the paper, to the platinum dish and burn to a white ash. Boil again wih hydrochloric acid; filter and wash. Incinerate the residue after the last filtration, for the determination of ash insoluble in acid and weigh.

Unite the two filtrates; make up to 500 c. c. and draw off two aliquot portions of 100 c. c. each, one for the determination of aluminum, iron, soluble silica, and the other for the determination of potash and soda.

Soluble Silica.—Eveaporate to dryness in a porcelain dish and heat at 110 degrees C. until no odor of hydrochloric acid can be detected, which usually takes four or five hours. Take up residue with dilute hydrochloric acid, filter, wash and ignite, and weigh soluble silica.

Alumina.—Add to the solution from the soluble silica, sodium phosphate enough to form normal aluminum phosphate; add ammonia until a precipitate remains on stirring, then hydrochloric acid drop by drop until the precipitate dissolves. Heat to about 50 degrees C.; add a considerable excess of 50 per cent ammonium acetate solution and 4 c. c. of 80 per cent acetic acid. As soon as the precipitate of aluminum phosphate, probably mixed with a little iron phosphate, has settled, collect on a filter, wash with hot water, ignite and weigh.

Fuse the mixed phosphates with ten parts of sodium carbonate, dissolve in dilute sulphuric acid, and reduce with zinc, and determine the iron by the permanganate method. To obtain the weight of alumina, subtract the sum of the weight of ferric oxide and phosphoric acid (determined elsewhere) from the weight of the mixed phosphates.

Lime.—Heat the filtrate from the mixed phosphates, which is acid with

RESULTS OF THE EXAMINATION OF TARTARIC ACID AN

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.	Weight of Package—Pounds.	Price Per Pound—
639	Royal	Royal Baking Powder Co., New York, N. Y.	E. B. Hackburn, New Bern, N. C.	½	
629	Cream of Tartar	R. C. Williams & Co., New York, N. Y.	Bizzell & Wooten, Goldsboro, N. C.	½	
668	Golden Seal	Pure Food Mfg. Co., Wilmington, N. C.	W. G. Upchurch, Raleigh, N. C.	½	
678	Royal	Royal Baking Powder Co., New York, N. Y.	W. C. Shell & Co., Hickory, N. C	½	
622	do	do	Barnes, Overman & Co., Wilson N. C.	½	
627	Cream	Price Baking Powder Co., New York, N. Y.	Bizzell & Wooten, Goldsboro, N. C.	½	
667	Royal	Royal Baking Powder Co., New York, N. Y.	M. Rosenthal & Co, Raleigh, N. C.	½	
661	do	do	E. K. Willis, Washington, N. C	½	
670	Cleveland's Superior.	Cleveland Baking Powder Co., New York, N. Y.	B. W. Upchurch, Raleigh, N. C	½	
695	do	do	Cooper & Gill, Statesville, N. C.	¼	
683	Cream	Price Baking Powder Co., New York, N. Y.	W. P. Turner & Co., Statesville, N. C.	1	
693	Solar	Fidelity Mfg. Co., New York, N. Y	Cooper & Gill, Statesville, N. C.	½	
1074	Ariston	Calumet Tea and Coffee Co., Chicago, Ill.	Sent by Howell Cobb, Greensboro, N. C.	------	------
641	Cream	Price Baking Powder Co, New York, N. Y.	E. B. Hackburn, New Bern, N. C.	½	
673	Carolina	H. R. Horne, Fayetteville, N. C	J. R. Ferrall & Co., Raleigh, N. C.	½	
644	Snow Flake	Tiger Mills, New York, N. Y	E. B. Hackburn, New Bern, N. C.	½	
672	Cleveland's Superior.	Cleveland Baking Powder Co., New York, N. Y.	J. R. Ferrall & Co., Raleigh, N. C.	½	

RESULTS OF THE EXAMINATION O

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.	Weight of Package—Pounds.	Price Per Pound—
638	Horsford's	Rumford Chem. Works, Providence, R. I.	E. B. Hackburn, New Bern, N. C.	¼	4
637	do	do	A. E. Cummings, Kinston, N. C	1	1
663	do	do	E. K. Willis, Washington, N. C	¾	2
667	do	do	W. C. Shell & Co., Hickory, N. C.	1	1
655	do	do	J. L. Starkey & Bros., Greenville, N. C.	¾	2
623	do	do	Barnes, Overman & Co., Wilson, N. C.	5-16	3
674	do	do	J. R. Ferrall & Co., Raleigh, N. C.	7-16	22 6-
684	Rumford's	do	W. P. Turner & Co., Statesville, N. C.	1	3
660	do	do	E. K. Willis, Washington, N. C.	½	3
640	do	do	E. B. Hackburn, New Bern, N. C.	½	3
625	do	do	I. B. Fonville, Goldsboro, N. C.	½	3
666	do	do	M. Rosenthal & Co., Raleigh, N. C.	½	3

CREAM OF TARTAR—TARTARIC ACID BAKING POWDERS.

Laboratory Number.	Carbonic Acid.			Potash (K_2O).	(Soda Na_2O).	Lime (Ca O).	Sulphuric Acid ($S O_3$).	Starch.	Total Tartaric Acid ($H_2 C_4 H_4 O_6$).	Cream of Tartar ($K H C_4 H_4 O_6$). †	Free Tartaric Acid ($H_2 C_4 H_4 O_6$). ‡	Bi-Carbonate of Soda ($Na H Co_3$). *	Water by Difference.
	Available.	Residual.	Total.										
639	11.37	0.55	11.92	12.00	10.85	------	------	13.79	43.87	48.0	5.47	22.78	7.57
629	10.41	0.84	11.25	8.75	10.04	------	------	22.18	34.59	35.0	6.59	21.51	13.19
668	10.74	0.26	11.00	14.33	9.36	------	------	10.72	47.87	57.32	0.02	21.02	------
678	10.99	0 84	11.83	12.11	10.71	------	------	13.79	41.36	48.44	2.61	22.60	10.21
622	12.21	0.57	12.78	11.50	14.02	------	------	15.41	42.67	46.08	5.76	24.42	3.62
627	11.59	0.63	12.22	8.49	30.33	0.15	------	20.34	36.29	33.96	9.12	23.35	12.18
667	12.29	0.65	12.94	11.30	10.64	------	------	13.74	41.65	45.20	5.49	24.72	10.00
661	11.82	0.38	12.20	11.26	10.89	------	------	16.16	41.65	45.04	5.62	28.31	7.84
670	9.92	1.10	11.02	13.03	9.91	0.27	------	13.07	44.33	52.12	2.64	21.06	8.64
695	12.42	0.42	12.84	12.35	9.72	------	------	11.81	43.12	49.40	3.60	24.53	10.16
683	11.17	0.35	11.32	9.48	9.32	------	------	21.10	37.76	37.92	4.42	22.01	11.06
693	10.26	1.69	11.95	13.15	11.61	------	------	11.19	42.13	52.67	0.06	22.83	10.69
1074	10.34	0.77	11.11	13.43	10.35	------	------	13.78	43.36	53.72	0.39	21.23	7.97
641	10.61	0.68	11.29	8.82	9.72	------	------	20.70	37.52	35.28	9.29	21.57	11.95
673	7.17	0.61	7.78	14.78	10.56	------	------	6.12	47.50	59.12	0.20	14.86	13.26
644	6.66	0.23	6.89	13.95	9.95	0.16	------	13.07	44.34	55.40	0.02	13.05	11.70
672	11.18	0.43	11.61	13.38	9.45	0.59	------	12.89	43.85	53.52	1.04	21.18	8.28

* Equivalent to the total carbonic acid. † Equivalent to potash.
‡ Tartaric acid not calculated as cream of tartar.

ACID PHOSPHATE BAKING POWDERS.

Laboratory Number.	Carbonic Acid.			Bi-Carbonate of Soda ($Na HC O_3$). *	Soda (Na_2O).	Lime (Ca O).	Phosphoric Acid ($P_2 O_5$).	Sulphuric Acid ($S O_3$).	Potash ($K_2 O$).	Starch.	Oxide of Iron ($Fe_2 O_3$).	Alumina ($Al_2 O_3$).	Ash Insoluble in Hcl.	Water by Difference.
	Available.	Residual.	Total.											
638	12.35	1.70	14.05	26.85	16.41	17.47	16.83	9.32	0.44	6.34	0.36	0.13	0.04	18.61
637	13.54	1.30	14.84	28.35	14.65	17.73	19.38	9.92	0.36	9.32	0.33	0.03	0.03	13.41
663	10.10	1.65	11.75	22.45	14.10	15.63	18.99	10.11	0.35	6.63	0.37	0.0	0.01	22.06
667	11.74	0.35	12.09	23.10	14.90	21.16	14.10	9.38	0.29	7.52	0.37	0.0	0.04	23.15
655	4.70	2.44	7.14	13.64	12.86	17.24	21.43	9.23	0.22	7.88	0.32	------	0.05	21.63
623	8.25	2.78	11.03	21.07	14.17	18.68	14.73	9.55	0.26	9.14	0.41	------	0.03	22.05
674	3.41	1.39	4.80	9.17	13.50	15.39	31.48	6.07	0.27	9.32	0.44	------	0.08	18.65
684	9.54	0.23	9.77	18.66	8.43	6.24	16.98	--------	0.29	38.26	0.21	0.02	1.12	18.68
660	9.74	0.53	10.27	19.62	8.24	6.68	16.53	--------	0.48	37.33	0.32	------	0.80	19.35
640	9.72	0.23	9.95	19.01	9.12	6.76	16.36	--------	0.47	25.85	0.18	------	0.06	31.25
625	2.86	0.54	3.40	6.49	9.08	7.30	17.99	--------	0.50	41.15	0.25	------	0.09	20.24
666	10.26	0.14	10.40	19.87	9.35	6.48	16.64	--------	0.55	36.72	0.34	------	1.22	18.30

* Equivalent to the total carbonic acid.

RESULTS OF THE EXAMINATION OF ALUM A

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.	Weight of Package - Pounds
643	Good Luck	Southern Mfg. Co., Richmond, Va	E. B. Hackburn, New Bern, N. C	¼
659	do	do	E. K. Willis, Washington, N. C	¼
654	do	do	J. L. Starkey & Bro., Greenville, N. C.	¼
676	do	do	W. C Shell & Co., Hickory, N. C	1
634	do	do	A. E. Cummings, Kinston, N. C	1
618	do	do	Barnes, Overman & Co., Wilson, N. C.	½
699	do	do	Sent by Cora A. Sloan, Montreat, N. C.	------
665	do	do	M. Bosenthal & Co., Raleigh, N. C	1
626	do	do	I. B. Fonville, Goldsboro, N. C	½
697	Rex, One Spoon	J. D. & R. S. Christian Co., Richmond, Va.	J. J. Phœnix, Greensboro, N. C	1
669	do	do	W. G. Upchurch, Raleigh, N. C	½
619	do	do	Barnes, Overman & Co., Wilson, N. C.	½
635	do	do	A. E. Cummings, Kinston, N. C	1
652	do	do	J. L. Starkey & Bro., Greenville, N. C.	¼
645	Blue Ribbon	Blue Ribbon Baking Powder Co., Richmond, Va.	E. B. Hackburn, New Bern, N. C	½
646	do	do	J. L. Starkey & Bro., Greenville, N. C.	½
620	do	do	Barnes, Overman & Co., Wilson, N. C.	½
675	do	do	W. C. Shell & Co., Hickory, N. C	1
631	do	do	L. L. Alphine, Goldsboro, N. C	½
692	Free Silver	Roanoke Chem. Co., Roanoke, Va	W. A. Calvert, Statesville, N. C	1
650	do	do	J. L. Starkey & Bro., Greenville, N. C.	¼
630	do	do	L. L. Alphine, Goldsboro, N. C	½
657	Sweetheart	Southern Soda Works, Nashville, Tenn.	T. F. Christain & Co., Greenville, N. C.	½
664	do	do	M. Rosenthal & Co., Raleigh, N. C	½
698	do	do	C. A. Clapp, Greensboro, N. C	1
690	Magnolia Pepsin	Magnolia Mfg. Co., Petersburg, Va	Norton Grocery Co., Statesville, N. C.	½
648	do	do	J. L. Starkey & Bro., Greenville, N. C.	1
689	Hermitage	Hermitage Baking Powder Co., Nashville, Tenn.	Norton Grocery Co., Statesville,	1
696	Game Cock	Va. Chem. and Mfg. Works, Portsmouth Va.	Wright & Davalt, Statesville, N. C	1
671	Parrot and Monkey.	Sea Gull Specialty Co., Baltimore, Md.	B. W. Upchurch, Raleigh, N. C	10-16
691	do	do	Norton Grocery Co., Statesville, N. C.	10-16
662	do	do	E. K. Willis, Washington, N. C	10-16
642	do	do	E. B. Hackburn, New Bern, N. C	10-16
628	do	do	Bizzell & Wooten, Goldsboro, N. C	10-16
679	Three Cent	Roanoke Chemical Co., Roanoke, Va.	C. L. Hawn, Hickory, N. C	5-16

ALUM PHOSPHATE BAKING POWDERS.

Laboratory Number.	Carbonic Acid. Available.	Carbonic Acid. Residual.	Carbonic Acid. Total.	Bi-Carbonate of Soda ($Na HCO_3$).*	Soda (Na_2O).	Potash (K_2O).	Alumina (Al_2O_3).	Anhydrous Soda Alum.†	Lime (CaO).	Phosphoric Acid (P_2O_5).	Oxide of Ammonia ($[NH_x]_2O$).	Starch.	Oxide of Iron (Fe_2O_3).	Ash Insoluble in Hcl.	Sulphuric Acid (SO_3).	Water by Difference.
643	15.41	0.50	15.91	30.40	15.42	0.28	6.43	30.48	------	------	0.07	20.16	0.31	0.10	21.30	20.02
659	14.10	0.40	14.50	27.71	12.60	0.56	6.25	29.63	------	------	3.31	17.60	0.23	0.09	21.06	23.83
654	14.07	0.50	14.57	27.84	16.08	0.36	6.44	30.53	------	------	0.05	19.44	0.32	0.13	21.52	21.09
676	14.11	0.26	14.37	17.46	15.68	0.24	6.48	30.31	------	------	0.03	19.44	0.40	0.08	21.62	21.66
634	14.98	0.31	15.29	29.20	12.50	0.54	6.36	30.15	------	------	3.34	14.51	0.29	0.06	21.39	25.73
618	14.65	0.22	14.87	28.41	12 09	0.74	6.13	29.06	------	------	3.32	15.05	0.23	0.10	21.04	26.43
699	12.75	0.28	13.03	24.90	15.59	0.20	4.65	22.04	------	------	0.09	18.14	0.48	0.08	22.0	25.74
665	15.17	0.60	15.77	30.13	16.07	0.33	6.57	31.14	------	------	0.07	22.53	0.34	0.11	21.82	16.39
626	13.88	0.27	14.15	27.04	11.31	0.71	6.17	29.25	------	------	3.30	35.60	0.30	0.07	20.80	7.59
697	9.24	1.22	10.46	19.91	12.76	0.28	4.88	23.13	1.11	2.88	0.09	29.41	0.28	0.04	15.77	22.04
669	8.98	1.32	10.30	19.68	12.86	0.33	4.82	22.85	1.12	3.08	0.14	32.04	0.44	0.05	15.15	19.67
619	10.55	1.38	11.93	22.79	15.15	0.32	6.32	29.96	0.73	1.30	0.06	22.72	0.33	0.08	19.64	21.42
635	10.99	0.49	11.48	21.93	11.74	0.09	6.08	28.82	0.83	2.13	2.66	27.54	0.48	0.03	19.16	17.76
652	11.22	1.67	12.89	24.63	14.88	0.32	5.70	27.02	1.41	2.31	0.24	24.37	0.33	0.35	18.90	18.40
645	6.78	1.32	8.10	15.47	16.32	0.13	6.80	32.23	0.28	0.64	0.04	27.18	0.23	0.15	21.23	18.50
646	8.07	0.74	8.81	16.83	15.52	0.16	7.42	35.17	0.25	0.69	0.08	23.83	0.30	0.09	21.91	21.91
620	10.11	1.34	11.45	21.88	15.82	0.06	6.74	31.95	0.06	------	0.05	15.98	0.32	0.22	20.84	28.46
675	13.36	0.34	13.70	26.18	12.50	0.28	7.01	33.23	0.05	------	2.90	19.62	0.34	0.03	21.55	22.02
631	9.13	1.52	10.65	20.65	15.37	0.25	6.47	30.67	------	------	0.08	17.78	0.46	0.17	19.93	28.84
692	11.50	0.70	12.20	23.31	13.83	0.33	5.61	26.59	0.35	------	0.09	23.29	0.46	0.13	18.78	24.93
650	10.28	0.22	10.50	20.06	8.41	0.10	4.98	23.61	0.43	------	2.58	23.83	0.23	0.10	16.27	32.67
630	9.31	0.72	10.03	19.16	12.03	0.29	5.76	27.30	------	------	1.72	22.53	0.23	0.12	18.77	28.52
657	13.69	1.73	15.42	29.46	17.13	0.29	6.80	32.61	0.96	------	------	--------	0.29	27.30	22.77	8.96
664	9.09	1.47	10.56	20.18	17.52	0.38	6.58	31.19	0.73	------	------	--------	0.36	27.21	23.23	13.33
698	14.40	1.60	16.00	30.57	16.83	0.22	6.98	33.09	0.90	------	------	--------	0.36	27.38	22.88	8.45
690	11.79	0.46	12.25	23.41	17.79	0.29	8.17	38.33	------	------	0.86	10.91	0.32	0.18	29.15	20.08
648	9.80	0.52	10.32	19.72	9.40	0.21	4.65	22.04	------	------	2.03	31.28	0.17	0.15	15.40	28.05
689	8.38	1.70	10.08	19.26	11.40	0.56	4.60	21.80	0.58	------	------	11.63	0.25	18.42	14.43	26.39
696	7.79	0.47	8.44	16.13	8.83	0.35	3.88	18.39	3.57	6.76	1.55	22.72	0.68	0.17	12.74	30.31
671	13.36	0.67	14.03	26.81	14.94	0.42	6.41	30.38	0.12	------	------	21.82	0.32	0.07	20.29	21.58
691	12.65	0.55	13.20	25.22	14.96	0.34	6.34	30.05	0.12	------	------	21.63	0.37	0.08	20.49	22.47
662	13.08	0.59	13.67	26.12	15.06	0.26	6.43	30.48	0.08	------	------	21.91	0 25	0.05	20.65	21.64
642	10.25	1.10	11.35	21.69	15.59	3.32	6.69	31.71	0.08	------	------	19.66	0.46	0.09	21.54	24.22
628	12.97	0.77	13.74	26.25	15.25	0.42	6.29	29.81	0.15	------	------	18.68	0.34	0.09	20.98	24.16
679	9.02	0.30	9.32	17.81	10.52	0.33	5.89	27.92	------	------	2.36	24.37	0.25	0.19	18.35	28.38

RESULTS OF THE EXAMINATION OF ALUM A

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.	Weight of Package—Pounds.
a688	One Spoon	Taylor Manufacturing Co., New York, N.Y.	W. P. Turner & Co., Statesville, N. C	3-16
680	Possum	Savannah Soda Co., Savannah, Ga	W. B. Yoder, Hickory, N. C	6-16
636	Va. Baking Powder.	Va. Chem. and Mfg. Works, Portsmouth, Va.	A. E. Cummings, Kinston, N. C	1
682	Ballard's Obelisk.	Ballard & Ballard, Louisville, Ky	Abernathy & Whitener, Hickory, N. C.	1
647	Our Daisy	J. S. Moore & Sons, Richmond, Va	J. L. Starkey & Bro., Greenville, N. C.	13-16
649	Mounten	Louis Harpel & Co., Baltimore, Md	do	¼
686	Sunflower	J. M. Fahnestock & Bro., Pittsburg, Pa.	W. P. Turner & Co., Statesville, N. C	1
651	Defiance (One Spoon).	Va. Chem. and Mfg. Works, Portsmouth, Va.	J. L. Starkey & Bro., Greenville, N. C.	¼
632	Old Dominion	C. L. Sauer & Co., Richmond, Va	L. L. Alphine, Goldsboro, N. C	¼
553	do	do	J. L. Starkey & Bro., Greenville, N. C.	¼
681	do	do	W. B. Yoder, Hickory, N. C	¼
694	Rolan	Smith, Harpel & Co., Baltimore, Md	Cooper & Gill, Statesville, N. C	½
624	Carolina		Woodard & Godwin, Weldon, N. C	1
633	Cream of Tartar	Va. Chemical Co., Portsmouth, Va	L. L. Alphine, Goldsboro, N. C	½
658	King (1 Spoon)	Bohannon & Blick, Portsmouth, Va	E. K. Willis, Washington, N. C	½
685	Baker's	Baker's Baking Powder Co., New York, N. Y.	W. P. Turner & Co., Statesville, N. C	1
656	Red Star	Gilbert Bros. & Co., Baltimore, Md	I. F. Christman & Co., Greenville, N. C.	½
b688	One Spoon	Taylor Manufacturing Co., New York, N. Y.	W. P. Turner & Co., Statesville, N. C	3-16
687	White as Snow	Baker's Baking Powder Co., New York, N. Y.	do	½
621	Crane	Pure Food Baking Powder Co., Chicago, Ill.	Barnes, Overman & Co., Wilson, N. C.	1
707	Leaven	Clover Chemical Works, New York, N. Y.	J. L. Starkey & Bro., Greenville, N. C.	6-16

ALUM PHOSPHATE BAKING POWDERS—Continued.

Laboratory Number.	Carbonic Acid. Available.	Carbonic Acid. Residual.	Carbonic Acid. Total.	Bi-Carbonate of Soda ($NaHCO_3$).*	Soda (Na_2O).	Potash (K_2O).	Alumina (Al_2O_3).	Anhydrous Soda Alum.†	Lime (CaO).	Phosphoric Acid (P_2O_5).	Oxide of Ammonia ($[NH_4]_2O$).	Starch.	Oxide of Iron (Fe_2O_3).	Ash Insoluble in Hcl.	Sulphuric Acid (SO_3).	Water by Difference.
a688	0.23	0.20	0.43	0.82	14.24	0.30	7.45	35.31	0.41	0.85	2.45	20.88	0.34	0.18	24.80	27.27
680	4.11	1.65	5.76	11.00	14.66	0.49	6.57	31.14	0.73	------	------	--------	0.47	32.93	19.35	19.04
636	15.03	1.42	16.45	31.43	16.98	0.19	6.03	28.58	9.73	------	------	--------	0.23	3.35	35.22	11.82
682	1.40	1.30	2.70	5.15	11.65	0.28	3.94	18.68	1.92	4.63	0.90	40.00	0.36	0.37	13.69	19.56
647	5.14	0.36	5.50	10.37	9.89	0.28	4.00	18.96	------	------	------	41.51	0.40	0.11	13.12	25.89
649	4.41	1.42	5.83	11.14	11.56	0.51	4.16	19.72	0.84	1.64	0.08	43.05	0.31	0.13	14.03	17.86
686	1.63	0.95	2.58	4.93	8.53	0.08	2.46	11.66	2.72	2.89	0.50	33.34	0.42	0.07	11.40	37.73
651	0.86	2.15	3.01	5.75	19.34	0.16	7.49	35.50	13.73	------	------	--------	0.40	2.02	43.21	10.65
632	10.69	0.71	11.39	21.76	14.33	0.33	5.47	25.93	0.62	1,82	------	32.35	0.40	0.10	19.63	13.56
653	11.44	0.76	12.20	23.31	14.43	0.23	5.78	27.40	0.79	2.01	------	24.95	0.36	0.18	19.73	------
681	9.98	1.19	11.17	21.34	15.10	0.27	5.52	26.16	0.88	1.46	0.60	25.67	0.44	0.12	19.87	18.90
694	1.41	0.76	2.17	4.14	10.31	0.28	3.42	16.21	2.22	5.30	1.25	39.02	0.23	0.20	21.41	24.19
624	9.75	0.45	10.20	9.49	12.47	0.39	6.62	31.38	------	------	3.26	22.36	0.13	0.33	21.87	22.37
633	0.91	0.25	1.16	2.21	9.88	0.23	5.47	25.93	------	------	2.55	24.71	0.34	0.04	17.85	33.77
658	11.61	0.47	12.08	23.08	14.10	0.29	5.47	25.93	------	------	------	28.12	0.28	0.19	18.81	20.66
685	2.50	1.05	3.55	6.78	10.04	0.02	3.02	14.31	2.28	5.25	1.66	31.46	0.24	0.05	11.77	30.66
656	11.44	0.75	12.19	23.29	10.82	0.31	4.16	19.72	------	------	------	36.72	0.28	0.15	14.14	21.23
b688	4.40	0.32	4.72	9.01	14.24	0.30	7.45	35.31	0.41	0.85	3.06	20.88	0.34	0.18	22.89	24.68
687	2.51	0.14	2.65	5.06	10.29	0.10	4.60	21.80	1.22	3.21	1.98	39.02	0.23	0.07	14.03	22.60
621	8.20	------	8.20	15.67	10.04	0.16	3.66	17.35	2.90	------	------	41.72	0.30	0.06	13.05	19.21
707	13.34	0.43	13.77	26.30	15.83	0.83	7.40	35.07	------	------	3.78	15.22	------	0.18	25.22	16.77

* Equivalent to the total carbonic acid. † Equivalent to the alumina.

acetic acid, to 50 degrees C., and precipitate with ammonia oxalate. Filter, wash, ignite over a Bunsen burner and finally convert into oxide by heating over a blast lamp. Then if desired to change to sulphate, which is more stable, add a few drops of sulphuric acid, evaporate, and ignite.

Potash and Soda.—Evaporate the aliquot portion of the solution, prepared as described above for this purpose, nearly to dryness, to remove excess of hydrochloric acid, dilute and heat to boiling. While still boiling, add barium chloride solution as long as a precipitate forms and enough barium hydrate to make the liquid strongly alkaline. As soon as the precipitate has settled, filter and wash with hot water; heat the filtrate to boiling. Add sufficient ammonium carbonate solution to precipitate all the barium; filter and wash with hot water. Evaporate the filtrate to dryness, ignite below redness to remove ammonium salts. Add to the residue a little water and a few c. c. of ammonium sulphate solution. Filter into a tarred platinum dish, evaporate and ignite to good redness, and weigh the mixed potassium and sodium sulphates.

Determine the potash as potassium platinichloride. Calculate to the sulphate and subtract from the total sulphates to obtain the sodium sulphate.

PHOSPHORIC ACID.

The official method of the A. O. A. C. was employed as follows:

Ignite 2 grams of the baking powder with 5 c. c. of magnesium nitrate solution, and dissolve in hydrochloric acid. In an aliquot portion of the solution determine phosphoric acid by the volumetric molybdic method.

SULPHURIC ACID.

Boil 5 grams gently for one and one-half hours with a mixture of 300 c. c. of water and 15 c. c. of concentrated hydrochloric acid. Make up to 500 c. c.; draw off 100 c. c., dilute considerably, precipitate with barium chloride; filter through a Gooch crucible, dry and weigh.*

AMMONIA.

The ammonia salts were determined by distilling with caustic soda into standard acid and titrated.

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* U. S. Dept. Agriculture, Division of Chemistry, Bulletin No. 46, Revised.

† U. S. Dept. Agriculture, Division of Chemistry, Bulletin 13, part 5, p. 596.

TEA.

BY C. D. HARRIS.

The tea plant is a hardy evergreen shrub, and tea is its prepared leaf. The plant is cultivated in China, Japan and Asia, and has also been introduced into India, Ceylon, Java and Brazil, and this country. China and Japan are still the leading tea-producing countries, although teas from India and Ceylon are now coming into extensive use. Tea has been cultivated in China for a thousand years, and in Japan since the beginning of the thirteenth century.

There are two kinds of tea—Black and Green. Both are leaves of the same kind of plant, the difference between the two being effected by the method of preparation. To prepare green tea, the leaves are dried by artificial heat immediately after picking, thus preserving the chlorophyle or green coloring matter. When black tea is desired, the leaves are subjected before drying to a fermentation, which changes their color to black and develops the characteristic flavor of black tea.

The alkaloid of tea, formerly known as "thein," has been shown to be identical with that of "caffein" of coffee, and to this principle are attributed the stimulating properties of both beverages.

Tea is an astringent and gentle excitant, and in its finer varieties exerts a decided influence over the nervous system, evinced by the feeling of comfort and even exhilaration which it produces and the unnatural wakefulness to which it gives rise, when taken in unusual quantities or by those unaccustomed to its use. Taken moderately and by healthy individuals it may be considered as perfectly harmless; but long continued in excessive quantity it is capable of inducing unpleasant nervous and dyspeptic symptoms, the necessary consequences of over-excitement of the brain and stomach.*

ADULTERATION OF TEA.

The falsifications of tea which are practiced to some extent may be divided into three classes:

(1) Additions made for the purpose of giving increased weight and bulk, and which includes foreign leaves and spent tea leaves, and also certain mineral substances, such as metallic iron, brick dust, etc.

(2) Substances added in order to produce an artificial appearance of strength in the extract of tea. Catechu and other bodies rich in tannin being mainly resorted to for this purpose.

(3) The imparting of a bright and shining appearance to an inferior tea by means of various coloring mixtures, as in "facing," which operation, while sometimes practiced upon black tea, is far more common with the green variety.*

Lie tea is sometimes found upon the market under the name of tea. It is tea dust mixed with foreign leaves, sand and other substances made into

* U. S. Dispensatory.

lumps with starch paste, and colored. The lumps break up when treated with hot water.

METHODS OF EXAMINATION.*

Foreign Leaves.—A sample of the tea is boiled with water, and the shape, venation, dentation and the microscopic character of the moist leaves noted.

Water is determined by drying two grams of finely powdered tea to constant weight at 100 degrees C.

Total Ash is determined by incinerating two grams of ground tea by the usual method.

Ash Insoluble in Water.—The ash from the determination of total ash is

RESULTS OF THE

Laboratory Number.	Brand Name from Label.	Wholesaler.	Retail Dealer.
819	Standard He-No	Martin, Gillett & Co , Baltimore, Md.	Overman, Barnes & Co., Wilson, N. C.
820	Nan-Kee-Soh, Standard	Bennett, Sloan & Co., New York, N. Y.	do
821	Gunpowder	do	do
822	Oolong, Extra Choice.	do	do
823	Kolom Char	do	do
824	Royal Gem	Chase & Sanborns, Baltimore, Md.	do
825	Pagoda	Pagoda Tea Co., Baltimore, Md.	A. E. Cummings, Kinston, N. C.
826	Black	Jeffries & Shelton, Richmond, Va.	do
827	Green	do	do
828	Ceylon Tea	Bohea Imp. Co., Baltimore, Md.	E. B. Hackburn, New Bern, N. C.
829	Royal Seal of China	do	do
830	do	do	do
831	Leggett's Blended	F. H. Leggett & Co., New York, N. Y.	do
832	Choice Blended	do	do
833	Royal Crest	Bohea Imp. Co., Baltimore, Md	do
834	Pagoda	Pagoda Tea Co., Baltimore, Md.	do
835	Mirado	Kenton Baking Powder Co., Cincinnati, Ohio.	do
836	Oolong, Best	Bohea Imp. Co., Baltimore, Md.	do
837	Best Gunpowder	do	do
838	Green	F. H. Leggett & Co., New York, N. Y.	do
839	Black	do	do
840	Green	Austin, Nichols & Co., New York, N. Y.	J. L. Starkey & Bros., Greenville, N. C.
841	Black	do	do
842	Green	Bennett, Sloan & Co., New York, N. Y.	E. K. Willis, Washington, N. C.
843	Black	do	do

* Battershall: Food Adulteration and Its Detection.

† Food Products: Connecticut Agricultural Experiment Station, Part II, page 128, 1901.

boiled with 50 c. c. of water and the insoluble portion collected on a Gooch crucible, washed with hot water, dried, ignited and weighed.

Ash Soluble in Water is obtained by subtracting the percentage of water insoluble from the percentage of total ash.

Hot water Extract.—Two grams of the ground tea are boiled with 200 c. c. of water for half an hour, care being taken to replace the water lost by evaporation. The leaves are collected on a weighed filter, washed thoroughly with boiling water, dried at 100 degrees C. and weighed. The sum of the percentages of insoluble leaf and of water subtracted from 100 per cent gives the percentage of hot water extract.

EXAMINATION OF TEAS.

Laboratory Number.	Date of Purchase.	Retail Price per Pound, Cents.	Water Per Cent.	Ash—Per Cent.			Hot Water Extract.	Remarks.
				Total.	Insoluble in Water.	Soluble in Water.		
	1900							
819	July 12	80	7.66	6.30	1.98	4.32	41.14	All of the samples of tea examined were faced with Prussian blue.
820	July 12	40	7.44	7.27	2.47	4.80	41.84	
821	July 12	60	5.84	7.20	1.96	5.24	46.09	
822	July 12	60	6.05	6.94	2.00	4.94	41.45	
823	July 12	40	4.58	5.30	1.85	3.45	45.50	
824	July 12	40	6.15	5.27	2.00	3.27	41.38	
825	July 18	60	6.89	5.73	2.30	3.43	36.44	
826	July 18	70	6.40	5.97	2.71	3.26	40.87	
827	July 18	70	5.39	7.40	3.91	3.49	37.45	
827	July 19	80	7.98	6.16	2.10	4.06	37.71	
829	July 19	80	5.76	6.25	2.36	3.89	43.51	
830	July 19	80	6.10	5.59	1.87	3.72	40.40	
831	July 19	60	7.92	5.98	2.05	3.93	36.45	
832	July 19	40	8.64	6.09	2.15	3.94	32.79	
833	July 19	80	7.00	6.19	1.83	4.36	34.48	
834	July 19	40	7.21	5.85	2.28	3.57	34.70	
835	July 19	40	7.65	5.79	2.42	3.37	33.48	
336	July 19	80	6.62	6.33	2.17	4.16	38.51	
837	July 19	80	6.86	6.42	2.47	3.95	42.29	
838	July 19	40	6.91	5.90	2.03	2.81	32.68	
839	July 19	40	7.87	5.80	2.70	3.10	29.46	
840	July 20	30	6.62	6.44	3.07	3.37	33.13	
841	July 21	30	7.22	6.02	2.12	3.90	37.16	
842	July 21	60	6.68	6.19	2.52	3.37	39.25	
843	July 21	60	6.85	5.47	1.86	3.51	39.80	

RESULTS OF EXAMINATION.

Interpretation of Results.—The percentage of total and water insoluble ash show whether or not the tea contains an undue amount of sand or mineral make-weights, and the percentages of hot water extract and water soluble ash indicate whether or not there is any considerable amount of exhausted leaves. From analyses of tea made elsewhere and the standard adopted in other countries, it would appear that genuine tea contains not more than 8 per cent of total ash, not less than 3 per cent soluble ash, and not less than 30 per cent extract.*

Results.—From the analyses of the teas reported in the previous table, it will be seen that only two teas (Numbers 838 and 839) fall below the standard, the deficiency being very slight in both cases.

Sample 819 contained a very few foreign leaves, which were yellowish-white and smaller than the tea leaf.

Sample 820 contained some horse hairs.

Sample 837 contained no whole leaves, all being broken.

The leaves of sample 834 were very large.

About half of the leaves of sample 836 were broken and half whole.

Every sample of tea examined was found to be faced with Prussian blue. Prussian blue in the quantity used for facing tea is likely not injurious, but inasmuch as it adds a useless foreign matter to the tea for the purpose of deception, making the tea appear better than it really is, its use should be discouraged.

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* Food Products, Conn. Exp. Station. Part II. Pages 131, 132. 1898.

COFFEE.

BY C. D. HARRIS.

As it is grown in different and widely separated parts of the world, it is natural that there should be considerable difference in the appearance, quality and flavor of coffee.

Mr. Thurber, who is an authority on coffee, says: "My experience at home and abroad leads me to the belief that two-thirds of the lovers of coffee are, from lack of knowledge, daily cheated out of the solid enjoyment of an ideal cup of coffee. The kind of coffee served in the average American restaurant or hotel is not calculated to command the homage of the savage or civilized creatures."

Within a few provinces of Brazil is produced more than one-half of the coffee supply of the world. The plant grows best on the uplands, at an elevation of from 1,500 to 4,500 feet above sea level. The deeper, freer and richer the soil the better. A mean temperature between 65 degrees or 70 degrees is desirable, and rainfall from 70 to 150 inches.

The trees are raised from seed in nurseries and transferred to their final positions when about one year or eighteen months old. The plants are set at intervals of 8 to 10 feet apart, in rows about the same distance. They begin bearing at the age of three or four years, their product annually increasing, and at six years they may be said to be in full bearing.

Different varieties of coffee show a great diversity of flavor, and even the same variety from different parts of a district will show like divergence. Different seasons produce different qualities.

Coffee, as imported into this country, contains portions of the outer covering, sticks and other foreign material. These are usually removed, the amount of such material left in the coffee depending on the thoroughness of the cleaning operation.

The properties and effects of coffee are thus described by Professor Johnston: "It exhilarates, arouses and keeps awake. It counteracts the stupor occasioned by fatigue, by disease, or by opium; it allays hunger to a certain extent and imparts a feeling of comfort and repose. Its physiological effects upon the system, so far as they have been investigated, appear to be that while it makes the brain more active, it soothes the body generally, makes the change and waste of matter slower and the demand for food in consequence less.

All the above effects it owes to the conjoint action of three ingredients very similar to those contained in tea," namely, volatile oil, coffeic, acid and coffeine, which is identical with theine, the stimulating ingredient of tea.

THE ADULTERATION OF COFFEE.

The adulteration of coffee may be defined, according to the pure food laws of this State, as follows: The addition of foreign matter of any kind to reduce the strength or effect the quality, the substitution of cheaper substances

in part or wholly for the genuine coffee; facing or coloring in imitation of better grades or to conceal damage, and the use of cereals in what is known as "blending." The cereals act simply as a dilutent, increasing the weight and bulk, without adding corresponding value to the product.

Coffee is adulterated in the following ways:

By facing, glazing, adding coffee screenings and foreign roots and seeds, and by the use of imitation coffee.

Facing.—It is not an uncommon practice to treat inferior or damaged coffee by some process for the improvement of its appearance and in imitation of better goods. Some of the substances used for this purpose are: Charcoal, clay, Prussian blue, indigo, lead chromate, azo colors, etc.

Facing is almost entirely confined to green coffees. All the samples reported on were examined for facing without detecting any.

Glazing.—Coffee is sometimes treated with sugar or syrup and then roasted. When the caramel formed on roasting amounts to more than an appreciable weight, it should be considered adulterated.

It is claimed by some roasters that glazing coffee prevents the loss of aroma and the absorption of odors that are injurious to it. Glazing coffee with sugar increases its weight usually about 12 per cent, without adding correspondingly to its value. Excessive glazing gives the berry a black appearance, and the dark brown caramel formed by roasting sugar colors the coffee infusion and makes it appear stronger than it really is.

Coffee Screenings.—These consist largely of fragments of coffee beans, immature and light grains, broken grains and foreign matter. Although coffee screenings consist largely of fragments of pure coffee beans, yet if sold as coffee or mixed with coffee they must be considered as adulterants.

Broken and immature grains may be separated from the whole grain. With ground coffee this is impossible. If sand is found in an appreciable quantity in ground coffee, coffee screenings may be inferred, and if the hull of the berry can be picked out of the coffee, this is an indication of screenings.

Imitation coffee consists of coffee-shaped grains made from wheat flour, bran, chicory and from roots of many plants. Imitation coffee mixed with pure coffee is an adulteration.

Ground coffee affords a very wide field for adulteration. This class of coffee is sold largely by the smaller dealers. The large stores usually grind the coffee to order, but in the latter case the presence of the purchaser does not always insure pure coffee.

Five ground coffees were examined; two were adulterated with foreign substances and two contained trash, etc.

METHODS OF EXAMINATION.

Glazing.—Twenty grams of the whole coffee beans are violently shaken with 500 c. c. of distilled water for five minutes, diluted to a litre; 50 c. c. of the filtered liquid evaporated, dried, weighed, ignited and the ash deducted. Pure roasted coffee shows from 0.44 to 0.72 per cent soluble organic matter, while coffee roasted with sugar gives from 1.87 to 8.18 per cent. With this as a basis it would be fair to assume that coffee giving an organic extract greater than one per cent has been glazed, while if more than 2 per cent, it has been excessively glazed.

To detect imitation coffee 25 to 50 grains, representing the sample, are broken and the inside examined for a yellowish white husk, which is only found in the real coffee bean. A grain by grain examination is necessary to detect imitation coffee. Roasted coffee will usually float on water or 40 per cent alcohol, while imitation coffee sinks. All samples were examined for imitation coffee, but none was found.

RESULTS OF EXAMINATION.

The object of this examination of coffee was to ascertain, as far as possible, to what extent the coffee sold in the State is adulterated.

Small amounts of coffee screenings in coffee are due to imperfect processes of screening. Large amounts, as in sample 814, where six per cent of the coffee is screenings, is considered adulterated. Samples 815, 787, 784, 785, 766 and 800 should also be considered as having too high a per cent of screenings.

GREEN COFFEE.

The green coffees were found to be freer than any of the others from adulteration, but some of these must be mentioned as containing foreign material.

Sample 772 contained pieces of rock.

Sample 779 contained pieces of wood and coffee hulls.

Sample 782 contained coffee hulls.

Sample 814 contained sixty per cent of rocks, peas, hulls, broken and damaged coffee.

Sample 804 contained quartz pebbles, etc., to such an extent that they were added to increase the weight of the coffee, and are, therefore, an adulteration.

Sample 811 contained some small pieces of quartz and sticks.

ROASTED COFFEE.

The following roasted coffees contained foreign material:

Sample 801 contained hulls.

Sample 776 contained stems.

Sample 799 contained quartz pebbles.

Sample 800 contained pieces of quartz and wood.

Sample 766 contained pieces of brick, wood and stems.

Sample 784 contained a few pieces of quartz.

Sample 785 contained some bark.

Sample 788 contained some pieces of wood, morning glory seed, and quartz pebbles.

Sample 775 contained a few hulls.

GROUND COFFEE.

Of the five ground coffees, two contained foreign substances and two contained soap, trash, etc.

In considering his work on coffee, in Bulletin No. 13, 1892, United States Department of Agriculture, Dr. Wiley says:

RESULTS OF THE

Laboratory Number.	Brand Name from Label.	Packer or Roaster.	Retail Dealer.
764	Old George Java and Mocha.	Isaac Newlin, New York	Barnes, Overman & Co., Wilson, N. C.
765	Arbuckle's Ariosa	Arbuckle Bros., New York	do
766	Lion Coffee	Woolson Spice Co., Toledo, Ohio	do
767	Yoro Blend	R. C. Williams & Co., New York	do
748	B. D. and T	Carhart & Bro., New York	do
769	Mocha and Java White Star.	Ohio Spice Co., Columbus, Ohio	do
770	White Star C	do	do
771	Rio Coffee (Green)	Charleston Imp. and Exp. Co., Charleston, S. C.	do
772	Pea Berry	do	do
773	African Java	Carhart & Bro., New York	do
774	La Guyara	John P. Cary, Richmond, Va	Wood & Godwin, Wilson, N. C.
775	Lion	Woolson Spice Co., Toledo, Ohio	I. B. Fonvilie, Goldsboro, N. C.
776	Arbuckles	Arbuckle Bros., New York	do
777	Our Blend	Chase & Sanborn, Boston, Mass	do
778	Santos	do	do
779	Rio	Austin, Nichols & Co., New York	do
780	do	do	do
781	Gautamala	do	do
782	African Java	Jeffries & Shelton, Richmond, Va	do
783	Cereal Health	Hecker, Jones, Jewell Milling Co., New York.	do
784	Princess	F. Middleton & Co., Philadelphia, Pa	Bizzell & Wooten, Goldsboro, N. C.
785	Levering's Reliable	E. Levering & Co., Baltimore, Md	L. L. Alphin, Goldsboro, N. C.
786	Green	Blalock & Neale, Richmond, Va	do
787	Lion	Woolson Spice Co., Toledo, Ohio	A. E. Cummings, Kinston, N. C.
788	Arbuckle's Ariosa	Arbuckle Bros., New York	do
789	Rio	R. C. Williams & Co., New York	do
790	Rio H. I. and P. R	Summerell & McKoy, Kinston, N. C.	do
791	Hackburn's Brand	F. H. Leggett & Co., New York	E. B. Hackburn, New Bern, N. C
792	(Anchor) Java	do	do
793	Mocha and Java	do	do
794	Breakfast Java	do	do
795	Oriole	Merchants' Coffee Co., Baltimore, Md.	do
796	Mocha and Java	Morse, Oppdyke & Co., New York	do
797	Cook's Choice	John R Cary & Co., Richmond, Va	J. L. Starkey & Bro., Greenville, N. C.
798	Sico	Jas. Heekin & Co., Cincinnati, Ohio	do
799	Arbuckle's Ariosa	Arbuckle Bros., New York.	do

EXAMINATION OF COFFEE.

Laboratory Number.	Date of Purchase.	Retail Price Per Pound, Cents.	Glazing Water Extract, Per Cent.	Broken and Damaged Coffee, Per Cent.	Immature Coffee, Per Cent.	Adulterants.
	1900					
764	July 12	25	0.49	------------	6.2	
765	July 12	25	1.35	7.7	4.7	Pebbles.
766	July 12	25	0.89	13.7	4.7	Pebbles and coffee stems.
767	July 12	25	0.53	3.92	2.3	
768	July 12	25	0.63	3.14	3.4	
769	July 12	40	0.72	------------	----------	
770	July 12	30	0 94	------------	4.3	
771	July 12	17	------------	------------	----------	
772	July 12	14	------------	3.0	----------	
773	July 12	20	------------	------------	----------	
774	July 12	20	------------	------------	----------	
775	July 14	25	1.03	7.0	4.4	Coffee hulls.
776	July 14	25	1.53	5.4	5.4	
777	July 14	30	0.53	------------	3.7	
778	July 14	25	0.84	------------	----------	
779	July 14	12½	------------	4.00	----------	Pieces of wood.
780	July 14	15	------------	2.00	----------	Pebbles.
781	July 14	20	------------	------------	4.0	
782	July 14	20	------------	3.00	----------	
783	July 14	25	------------	------------	----------	
784	July 16	25	0.79	9.5	6.7	Rocks, stems and coffee hulls.
785	July 16	25	0.89	9.2	4.7	Rocks and pieces of wood.
786	July 16	12½	------------	------------	5.00	
787	July 18	17½	2.10	16.8	8.5	
788	July 18	17½	1.50	------------	----------	
789	July 18	16	------------	------------	----------	
790	July 18	15	------------	4.0	----------	Coffee stems.
791	July 19	15	0.63	3.0	7.2	
792	July 19	12½	1.16	------------	8.4	
793	July 19	15	0.72	6.0	9 5	
794	July 19	17½	0.43	------------	9.3	
795	July 19	17½	0.59	8.8	6.6	
796	July 19	17½	0.32	4.4	4.4	
797	July 20	20	0.89	8.3	5.5	Dirt, pebbles and coffee stems.
798	July 20	25	0.56	3.5	2.2	
799	July 20	15	1.61	7.6	3.0	Coal, pieces of wood and coffee hulls.

"The examination of coffee and coffee preparations on our markets shows that the consumers, and especially the poor, are being grossly deceived. Very little pure coffee is sold, and even whole coffee does not escape sophistication."

The purchase of green coffee for home roasting does not insure a pure product, since even the green coffee is imitated.

RESULTS OF THE

Laboratory Number.	Brand Name from Label.	Packer or Roaster.	Retail Dealer.
800	Lion Brand	Woolson Spice Co., Toledo, Ohio	J. L. Starkey & Bro., Greenville, N. C.
801	Mocha and Java (Good Luck).	Aragon Coffee Co., Richmond, Va	do
802	Va. Coffee, bulk	Va. Candy Co., Richmond, Va	do
803		Jeffries & Shelton, Norfolk, Va	do
804	Green Coffee	E. A. Sanders, Richmond, Va	do
805	Laguiro	F. H. Leggett & Co., New York	F. H. Christmas & Co., Greenville, N. C.
806	Fine Grain Coffee	do	do
807	African Java		E. K. Willis, Washington, N. C.
808	Santa	Carhart Bros., New York	do
809	Rio	do	do
810	Ground Coffee	Bohannon & Blick, Portsmouth, Va	do
811	Rio	Carhart & Bro., New York	do
812	Essence for Coffee	P. C. Tomson, Philadelphia, Pa	W. B. Mann, Raleigh, N. C
813	Tomson-Hummel Brand	Natural Essence for Coffee Co., Philadelphia, Pa.	J. R. Ferrall & Co., Raleigh, N. C.
814	"B. M"	Davenport & Morris, Richmond, Va	B. W. Upchurch, Raleigh, N. C.
815	Rio	F. Middleton & Co., Philadelphia, Pa	do
816	Excellent	N. Y. Coffee Co., New York	do
817	Ground Coffee	John R Cary, Richmond, Va	do
818	Essence for Coffee	Parish Bros., Baltimore, Md	J. W. Scott & Co., Greensboro, N. C.

From the examination of coffee just made in this laboratory, it may be said that the ground coffees are perhaps still adulterated to a large extent, but the green and roasted coffees are not so much sophisticated as they were some few years ago.

EXAMINATION OF COFFEE—*Continued.*

Laboratory Number.	Date of Purchase.	Retail Price Per Pound, Cents.	Glazing Water Extract, Per Cent.	Broken and Damaged Coffee, Per Cent.	Immature Coffee, Per Cent.	Adulterants.
800	July 20	15	1.51	12.00	3.7	Coffee stems.
801	July 20	20	0.59	4.7	5.7	Coffee hulls and other foreign substance.
802	July 20	15	----------	----------	----------	2 per cent trash, etc.
803	July 20	15	----------	----------	----------	20 per cent starch and other foreign material.
804	July 20	10	----------	4.20	----------	Pebbles and coffee hulls.
805	July 20	15	1.07	9.0	5.8	
806	July 20	10	----------	----------	----------	2 per cent trash, etc.
807	July 21	20	----------	3.0	----------	
808	July 21	20	----------	----------	----------	
809	July 21	15	----------	----------	----------	
810	July 21	20	----------	----------	----------	15 per cent starch and other foreign material.
811	July 21	20	----------	10 00	3.20	Coffee stems and pebbles.
812	Aug. 4	----------	----------	----------	----------	
813	Aug. 4	----------	----------	----------	----------	
814	Aug. 4	10	----------	48.40	10.83	Peas, bebbles, coffee hulls and stems.
815	Aug. 4	12½	1.25	10.4	6.3	
816	Aug. 4	20	0.52	----------	----------	
817	Aug. 4	10	----------	----------	----------	2 per cent trash, etc.
818	July 16	----------	----------	----------	----------	

SUGAR.

BY W. M. ALLEN.

By the term sugar is generally understood cane sugar, or sucrose, which is made mainly from sugar cane and sugar beets. In commerce it is referred to as loaf, pulverized, soft white and brown sugar. The first three are usually almost pure sugar, while the last two generally contain some water and a small amount of molasses which have not been removed in the process of manufacture. Attempts have been made to adulterate cane sugar with glucose sugar made from corn starch, the product being sold under the name of new process sugar. On account of the difficulty of drying glucose, this product is sticky and difficult to handle, and fairly easy to recognize.

The chief adulterant of sugar, if it may be called such, is water, and that is found only in the low-grade brown sugars. Sugar sometimes receives a special treatment known as "bluing," to prevent a gray or "dead" appearance. Ultramarine, a natural blue pigment, obtained from a mineral which occurs in Siberia, Persia, Thibet, and some other localities,* is the substance usually employed for this purpose. It only improves the appearance of the sugar, without adding materially to the weight. Poor grades of sugar are sometimes excessively blued, and on solution yield a blue color. This form of adulteration can be detected by dissolving some of the sugar in a small amount of water, and noting the color.

RESULTS OF EXAMINATION.

Nineteen samples, as follows, six granulated, four pulverized, four loaf, one soft white "A," and four brown sugars, were purchased in the several towns of the State and examined.

All of these samples, except the brown, which are low-grade sugars, contain from 98.5 to 100 per cent sugar, and only one other sample, which is the soft white "A," contains less than 99 per cent, showing that they are remarkably pure.

The brown sugars, which are low grade, could hardly be said to be adulterated, as they only contain water, some molasses, and coloring matter, which were not removed in the process of manufacture.

No. 854, Extra "C," is the lowest grade sugar examined, and contains only 83.5 per cent real sugar. The impurities are water and molasses mainly.

The results of the analyses and other data relating to the samples are in the following table:

* Century Dictionary and Encyclopedia.

RESULTS OF THE EXAMINATION OF SUGAR.

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.	Price Per Pound.	Per Cent Pure Cane Sugar. (Sucrose).
844	Granulated	Franklin Refining Co., Philadelphia, Pa.	Barnes, Overman & Co., Wilson, N.C.	$0.7	99.8
845	Loaf	Carhart & Bro., New York, N.Y.	do	.7	99.8
846	Pulverized	do	do	.8	99.7
847	Granulated	Franklin Refining Co., Philadelphia, Pa.	I. B. Fonville, Goldsboro, N.C.	.7	99.8
848	4 X Pulverized	do	do	.10	100
849	Cube	do	do	.10	100
850	Granulated		A. E. Cummings, Kinston, N.C.	.7	99.1
851	Brown		do	.6	91.7
852	Pulverized	Slater, Myers & Co., Richmond, Va.	Myers & Midgette, Kinston, N.C.	.7½	99.8
853	Loaf	Francis H. Leggett & Co., New York, N.Y.	do	.10	99.8
854	Extra "C"	B. A. Harrell, Son & Co., New York, N.Y.	E. B. Hackburn, New Bern, N.C.	.6	83.5
855	"A"	do	do	.6	98.5
856	Fine Granulated	do	do	.7	99.8
857	Cut Loaf	do	do	.8	99.3
858	Powdered	do	do	.8	99.8
859	Granulated	W. E. Mewborn, Kinston, N.C.	J. L. Starkey & Bro., Greenville, N.C.	.7	99.9
860	Brown	do	do	.6	86.5
861	Extra "C"	The Maulenhaur Sugar Refinery New York, N.Y.	E. K. Willis, Washington, N.C.	.6	90.0
862	Granulated	do	do	.7	99.9

METHOD OF EXAMINATION OF SUGAR.

These determinations were made by direct reading with the polariscope, as follows: 26.048 grams of sugar was dissolved in water in 100 c. c. flask and made up to the mark. The readings were made direct at room temperature, in 200 mm. tube.

MOLASSES, SYRUPS AND HONEY.

BY J. M. PICKEL, W. G. HAYWOOD AND F. C. LAMB.

MOLASSES.

By molasses is generally understood a product derived wholly from sugar cane or sorghum.

Of the fourteen samples examined by us, all except one (No. 440) gave evidence of containing much glucose, and are, therefore, classed as adulterated—they are mixtures of glucose with molasses. This does not mean that they are unwholesome. Glucose, when properly made from starch, is doubtless a wholesome article of food.

The sugars naturally present in genuine molasses are sucrose (or cane sugar) and *reducing* sugars, or *invert* sugar. Invert sugar consists of equal parts of dextrose (glucose) and levulose (sometimes called fruit sugar), and is produced by "inverting" sucrose, that is, by boiling it with dilute acids, especially mineral acids. (Complete change can be brought about below the boiling point.) The sugar manufacturer and refiner can not prevent the formation of invert sugar, but endeavors to reduce it to a minimum. His object is to reclaim the largest possible amount of merchantable sucrose, or cane sugar; and in the proportion that he by modern improved methods succeeds, in the same proportion does his by-product, molasses, deteriorate. In a report to the United States Department of Agriculture, made in 1891, Professor W. C. Stubbs, director of the Louisiana Experiment Station, says:

"Three kinds of molasses made from sugar cane are sold on the New Orleans market. The first of these is the open-kettle sugar molasses, usually of fine color and flavor and rich in sugar. The quantity of this molasses offered on the market diminishes from year to year as the more modern methods of manufacture supplant those heretofore in use. The second and rapidly increasing kind is centrifugal molasses. This product is much inferior to open-kettle molasses, and when two crops of sugar have been taken from it, is little better than 'black strap.' It is largely used for mixing with glucose. There may be found a very limited supply of a kind of molasses known as *sirop de batterie*, made by boiling the clarified juice almost to the crystalizing point. This kind of molasses is esteemed a great delicacy."

He gave the following analyses of genuine molasses bought on the New Orleans market, stating at the same time that adulteration with glucose had become a very common practice there:

	Sucrose.	Reducing Sugars.
Open-kettle molasses, six samples	41.5 to 56.8 per cent.	23.6 to 17.3 per cent.
Centrifugal molasses, twenty samples	26.5 to 48.7 "	33.0 to 23.5 "
Refinery molasses, three samples	30.5 to 42.7 "	29.4 to 28.6 "
Sirop de batterie molasses, three samples	48.6 to 54.7 "	16.3 to 12.0 "
Black Strap molasses, one sample	32.6 "	23.5 "
Sorghum molasses, six samples	27.0 to 48.7 "	13.6 to 9.8 "

(The last two are not the work of Professor Stubbs, but of other analysts.)

SYRUPS.

Ten articles sold as syrup, or corn syrup, are reported on in this paper. All are mixtures of glucose and molasses, and are highly colored. Only one (No. 424) contains a considerable per cent (25.1) of cane sugar. The chief difference between these syrups and the so-called molasses lies in the fact that the syrups contain upon the whole more glucose, which is made by treating starch with dilute mineral acids. These syrups were all sold for table use.

MAPLE SYRUP.

Maple syrup is made by evaporating the sap of the sugar maple tree. The sugar in this sap is the same as that in the juice of the sugar cane. It is, therefore, easily possible to make imitations of both maple sugar and syrup which it is well-nigh impossible to distinguish from the genuine. This is done by mixing enough genuine maple sugar or syrup with brown sugar to give it the requisite flavor. The extract of hickory bark is said to be largely used for imparting a maple-like flavor; the process is patented. The three samples examined by us may be genuine, but if so, they are thin, that is, contain so much water that the per cent of sucrose is not high, and the grade, therefore, low. Leffmann and Beam report three genuine maple syrups whose sucrose ranges from 56 to 62.4 per cent. The three samples here reported contain 28.3 to 42.4 per cent.

GRADE AND QUALITY OF MOLASSES AND SYRUPS.

The grade and quality of syrups and of genuine molasses vary greatly. This is a matter of such importance that the Congress of the United States appropriated $20,000 for the year 1902-3, to be expended in the study of the proper treatment and processes for securing uniformity of grade and quality.

HONEY.

Pure honey may be defined as "the nectar of flowers and other saccharine exudations of plants, gathered by bees and stored in cells built, at least in part, by the bees themselves." Honey made by bees which are fed upon glucose, cane sugar or invert sugar would not, according to this definition, be pure honey.

MOLASSES, SYRUPS

Laboratory Number.	Name of Article.	Name of Brand.	Manufacturer or Wholesaler.	Bought of—
414	Molasses	New Orleans	Henry L. Habbart & Co., New York.	M. Rosenthal, Raleigh, N. C.
415	do	Porto Rico	do	do
417	do	do	do	W. B. Mann, Raleigh, N. C.
419	do	Cuba	R. H. Hicks, Wilmington	B. W. Upchurch, Raleigh, N. C.
420	do	Rosedale New Orleans.	Henry L. Habbart & Co., New York.	do
426	do	West India	W. M. Powell & Co., Baltimore, Md.	E. B. Hackburn, New Bern, N. C.
427	do	do	do	E. K. Willis, Washington, N. C.
428	do	New Orleans	Maryland Refining Co., Baltimore, Md.	do
429	do	Porto Rico	Summerlin & McCoy, Kinston, N. C.	A. E. Cummings, Kinston, N. C.
433	do	Saint Kit's	E. Peterson & Co., Washington.	T. F. Christian & Co., Greenville, N. C.
435	do		C. C. Covington, Wilmington.	Barnes, Overman & Co., Wilson, N. C.
436	do		do	do
440	do	New Orleans	Austin, Nichols & Co., New York.	E. B. Hackburn, New Bern, N C.
447	do	Matansas	Henry L. Habbart, New York	W. G. Upchurch, Raleigh, N. C.
422	Syrup, Maple	Green Mt	Austin, Nichols & Co., New York.	
439	do	Silver Leaf	F. H. Leggett & Co., New York.	E. B. Hackburn, New Bern, N. C.
442	do	Maple	Hudson Packing Co., New York.	E. K. Willis, Washington, N. C.
410	Syrup, Corn	Karomel	T. S Southgate & Co., Norfolk, Va.	E. B. Hackburn, New Bern, N. C.
411	Syrup	Golden Glory	Davenport Refining Co., Davenport, Ia.	A. E. Cummings, Kinston, N. C.
412	do	Eureka Honey Drip.	John R. Cary & Co., Richmond, Va.	J. L. Starkey & Bro., Greenville, N. C.
416	do		Henry L. Habbart & Co., New York.	M Rosenthal, Raleigh, N. C.
418	do	Vanilla Drip	R. H. Hicks, Wilmington	B. W. Upchurch, Raleigh, N. C.
424	do	VanillaSyrup	J. A. Andrews, Agt., Greenville, N. C.	J. L. Starkey & Bro., Greenville, N. C.
430	do	Porto Rico	T. W. Mewborn, Kinston, N. C.	A. E. Cummings, Kinston, N. C.
431	do	Cocoanut	R. C. Williams & Co., New York.	do
432	do	Ideal	F. H. Leggett & Co., New York.	T. F. Christian & Co., Greenville, N. C.
437	do		R. W. Hicks, Wilmington	Barnes, Overman & Co., Wilson, N. C.
444	Honey	Pure Strained	F. H. Leggett & Co., New York.	E. B. Hackburn, New Bern, N. C.
445	do	Comb Choice Honey.	Hudson Preserving Co., New York.	E. K. Willis, Washington, N. C.
446	do	Orange Blossom.	Austin, Nichols & Co., New York.	W. B. Mann, Raleigh, N. C.
586	do	Schimmel's Cal. Honey.	The American Preserve Co., Philadelphia.	J. W. Scott & Co., Greensboro, N. C.
587	do	Honey Choice Comb.	Hudson Preserving Co., New York.	do

* At these rates when bought by the pint.

† At these rates when bought by the quart.

Laboratory Number.	Date of Purchase.	Retail Price Per Gallon.	Water, Per Cent.	Ash, Per Cent.	Sucrose, Per Cent.	Polarization. Temperature.	Direct.	After Inversion.	At 86°—88°.	Remarks.
	1900	Cts.								
414	Aug. 4	75	24.03	2.13	7.1	29.0	120.6	111.4	95.8	Adulterated with glucose.
415	Aug. 4	50	25.41	2.65	25.0	32	89.6	57.6	57.4	Do.
417	Aug. 4	50	25.03	2.86	26.2	31	83.2	49.6	50.8	Do.
419	Aug. 4	20	31.86	4.68	20.5	32.5	27.8	1.6	11.2	Do.
420	Aug. 4	40*	28.72	1.24	5.4	31	120.2	113.2	98.6	Do.
426	July 19	40*	20.21	1.42	17.3	32	122.2	100.0	89.2	Do.
427	July 21	40*	22.21	1.89	27.1	32.5	110.6	77.0	71.4	Do.
428	July 21	80*	26.11	1.26	14.1	32	99.4	81.4	73.2	Do.
429	July 18	--------	24.97	2.90	10.8	32	69.0	55.2	54.6	Do.
433	July 20	40*	26.71	3.30	17.1	31	74.0	52.0	51.6	Do.
435	July 12	60	25.72	1.70	12.1	33	89.6	61.0	59.0	Do.
436	July 12	40	24.61	3.07	11.5	32	90.0	75.2	69.8	Do.
440	July 19	50	27.20	3.82	36.7	28.5	33.0	—14.6	3.2	Not found adulterated.
447	Aug. 4	40	---------	------	10.9	25.5	107.2	92.8	82.2	Adulterated with glucose.
422	July 20	2.00*	31.45	0.16	42.4	31.0	40.2	—14.4	2.4	Inferior.
439	July 19	2.00†	34.33	0.72	28.3	29	24.5	—12.2	3.6	Do.
442	July 21	1.20†	24.03	0.10	39.2	26	31.8	—19.6	1.0	Do.
410	July 19	80‡	19.55	1.18	6.6	29	141.0	132.4	112.6	Mixture of glucose and molasses.
411	July 18	80‡	19.56	0.91	4.5	29	151.0	145.2	122.4	Do.
412	July 20	40‡	18.89	0.70	4.8	29	151.0	144.8	124.2	Do.
416	Aug. 4	40	18.85	1.05	7.4	29	142.2	132.6	115.0	Do.
418	Aug. 4	35‖	19.20	2.03	14.8	32	118.8	99.8	91.8	Do.
424	July 20	40‖	24.03	3.38	25.1	33.5	76.4	44.6	44.4	Do.
430	July 18	40‖	18.72	0.47	2.5	31.5	161.8	158.6	133.6	Do.
431	July 18	2.00‖	29.69	0.35	5.1	31	114.4	107.8	90.4	Do.
432	July 20	40‖	21.40	1.74	10.1	31	132.4	119.0	104.0	Do.
437	July 12	40	18.98	1.35	9.8	32	152.2	139.4	120.0	Do.
444	July 19	2.00§	---------	------	3.9	25.5	—5.6	—10.8	10.6	Probably genuine.
445	July 21	2.40§	---------	------	1.7	28	134.4	132.2	111.6	Not honey. Mainly glucose.
446	Aug. 4	4.00§	---------	------	4.2	28	—12.8	—17.2	4.2	Probably by bees fed on sugar.
586	Aug. 16	--------	---------	------	2.2	28	68.2	65.4	64.4	Not honey. Mainly glucose.
587	Aug. 16	--------	---------	------	3.8	28.5	121.6	117.0	102.4	Do.

‡ At these rates when bought in quart cans.
‖ At these rates when bought by the pint or quart.
§ At these rates when bought in pint and half-pint jars.

Honey is subject to much adulteration, the adulterants (and substitutes) being glucose, cane sugar and invert sugar, and mixtures of these. "Honey in the comb" is frequently glucose which has acquired a more or less honey odor and flavor by being poured into comb from which the genuine article has been drained.

Three of the five samples examined by us (Nos. 445, 586 and 587) consist of glucose with a little sucrose. No. 586 contained enough honey to impart the distinct odor of honey. Nos. 445 and 587 have no such odor; note their suspicious label—"*Comb Choice Honey Compound.*" No. 444 is probably genuine. No. 446 is possibly from bees fed on sugar.

METHOD OF ANALYSIS.

Polarization.—Half the normal quantity (13.024 grams) was weighed, dissolved in water, clarified (when necessary) with 1 to 2 c. c. of lead-subacetate and 1 c. c. of aluminum cream, made up to 100 c. c., filtered and, when necessary, decolorized with thoroughly dried boneblack; 50 c. c. of the filtrates were inverted by adding 5 c. c. of concentrated hydrochloric acid and heating 10 minutes at 68 to 70 degrees, while submerged in water. The inverted solutions frequently needed to be further decolorized with boneblack. The readings of the saccharimeter were corrected for the normal (26,048 grams). The per cent of sucrose was calculated by the formula $S=\frac{a-b}{124-\frac{t}{2}}$ *a* being for the direct, the invert reading being in all cases the same). the direct, and *b* the invert reading, and *t* the temperature (this

JELLIES.

BY W. M. ALLEN, W. G. HAYWOOD, AND F. C. LAMB.

Fruit jelly is a gelatinous product made by cooking the fruit, separating the juice and cooking it with sugar in the proportions of about one to one. To be a pure jelly it must be made from the fruit specified and cane sugar. If properly made it is almost clear. The sale of jellies containing any other ingredients than these, unless distinctly labeled as imitations or compounds, is illegal in North Carolina under the pure food law.

ADULTERANTS.

Gelatinous Materials.—Gelatine, starch paste and jellies made from cheaper fruits, such as apples, are used as adulterants. Agar-agar, a gelatinous material made from sea mosses in India and other Eastern countries, is said to be employed. It and starch paste have little taste and no color, and are convenient stiffeners of artificial jelly. They, together with the cheaper jellies, are colored and flavored with various dye stuffs and flavoring extracts, and are easily transformed into counterfeit jelly.

Sweeteners.—On account of its sweetness, glucose is commonly used. When pure, glucose is wholesome, but it frequently contains sulphurous acid, left in the process of manufacture, which is injurious and very objectionable in food products. Besides, glucose is very much inferior to cane sugar as a sweetener. Saccharine, made from coal-tar products, is also employed as artificial sweetening, as well as for preserving the product. Unlike cane sugar and glucose, saccharine has no nutritive value.

Coloring Materials.—Coal-tar dyes, cochineal, and probably some vegetable dyes, are used to give artificial color to jellies. It has been shown that some of the coal-tar dyes retard the process of digestion, and, therefore, could hardly be regarded as fit ingredients for food. But even if they were not injurious, they serve to make the materials appear better than they really are, and, therefore, deceive the user.

Flavors.—Extracts made artificially for flavoring jellies, jams, preserves and fruit butters are used for flavoring the cheaper and artificial jellies.

Acids.—Citric, tartaric and other acids are added to artificial jellies to give them the desired acid taste.

Chemical Preservatives.—Formaldehyde, salicylic and benzoic acids are the common preservatives for jellies. Saccharine, which has been mentioned above as a sweetener, is also an antiseptic. The use and effect of preservatives or antiseptics has been discussed in the first report on food products, *Bulletin*, Department of Agriculture, for December, 1900, page 10.

RESULTS OF THE EXAMINATION OF JELLIES.

Ten samples of jelly have been examined, all of them being adulterated in some way or other. They all claim to be pure jellies made of the fruit speci-

RESULTS OF THE EXAMINA-

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.
457	Queen City Grape	The J. Miller Co., Cincinnati, O	B. W. Upchurch, Raleigh, N. C.
462	Queen City Currant	do	do
458	Queen City Strawberry.	do	do
598	Economy Jelly	The West Virginia Preserving Co., Wheeling, W. Va.	W. C. Shell & Co., Hickory, N. C.
464	Currant	Anderson Preserving Co., Wheeling, W. Va.	J. L. Starkey & Bro., Greenville, N. C.
465	Raspberry	Ohio Preserving Co., Camden, N. J	do
453	Cherry Jelly	Williams Bro. & Charbonneaux, Detroit, Mich.	A. E. Cummings, Kinston, N. C.
466	Clifford's Currant	Anderson Preserving Co., Baltimore, Md.	J. L. Starkey & Bro., Greenville, N. C.
603	Sherry (calves foot)	Reid, Murdock & Co., Chicago, Ill	J. W. Scott & Co., Greensboro, N. C.
599	Raspberry (best quality).	Williams Bro. & Charbonneaux, Detroit, Mich.	W. B. Yoder, Hickory, N. C

fied, except two, Nos. 603 (calves foot) and 466 (Clifford's currant). The latter claims to be a compound jelly, composed of 40 per cent apple juice, 6 per cent other fruit juice, 24 per cent granulated sugar (sucrose), and 30 per cent glucose. The analysis shows that it only contains 0.6 per cent granulated sugar, with a large amount of glucose. Containing 40 per cent apple juice, with only 6 per cent of other fruit juice, it should have been a light yellow color, but instead it was a dark red, showing that it was artificially colored, the color proving it to be a red coal-tar dye. It was preserved with formaldehyde.

Of these ten samples, four are largely composed of starch paste, artificially colored, and preserved with a chemical preservative. These are partially, at least, if not wholly, artificial jellies. Six of them are artificially preserved with an objectionable preservative (formaldehyde). They all contain glucose instead of cane sugar. Some of the samples contain only one adulterant, while others have several, and some of them are made up entirely of artificial materials. None of them are pure products.

The adulterants of each brand are shown in the tables.

METHODS OF EXAMINATION OF JELLIES.

The same methods that were used for the examination of jams, fruit butters and preserves were used in the examination of jams.

(See jams, fruit butters and preserves.)

NATION OF JELLIES.

Laboratory Number.	Quantity in Package.	Retail Price Per Package	Gelatinous Matter.	Sugar.		Coloring Matter.	Preservative.
				Glucose.	Cane Sugar Per Cent.		
457	1 quart	$0.15		Glucose	.39		
462	1 quart	.15		do		Eosine	Formaldehyde.
458	1 quart	.15		do		do	Do.
598	½ pint	7½	Starch paste	do	.70		
464	½ pint	.15	do	do	1.40	Coal-tar dye	Do.
465	½ pint	.15		do	1.70		
453	1 quart	.20	do	do		Alizarine	Do.
666	½ pint	.15	Apple jelly	do	.60	Tropoline	Do.
603	¾ pint	.50		do			
599	1 quart	.15	Starch paste	do			Do.

ANALYSES OF JELLIES.

Laboratory No.	The Jellies Were Claimed to be—	Water, Per Cent.	Total Solid, Per Cent.	Ash, Per Cent.	Nitrogen, Per Cent.	Polarization.					Sucrose.
						Direct.		After Inversion.			
						Reading.	Temp. Deg. C.	Reading.	Tem. Deg. C.	Reading at 86° C.	
457	Grape	37.07	62.93	.59	.08	93.5	32	93.0	32	77.5	.39
462	Currant	36.39	63.61	.58	.04	92.0	32	92.0	32	80.0	
458	Strawberry	33.75	66.25	.66	.07	99.4	30	99.4	30	88.6	
598	Blackberry	22.96	77.04	.63	.06	89.4	28	88.5	28	79.9	.70
464	Currant	30.87	69.13	.42	.04	89.3	29	87.5	29	85.9	1.40
465	Raspberry	23.44	76.56	.57	.03	109.5	29	107.3	29	95.0	1.70
453	Cherry	31.31	68.59	.42	.03	91.0	30	91.0	30	80.0	
466	Compound	34.31	65.69	.46	.04	93.0	30	93.0	30	80.0	.60
603	Sherry (calves foot)	65.17	34.83	.22	1.09	89.4	28	89.4	28	79.0	.69
599	Raspberry	32.34	67.66	.42	.12	76.	30	76.0	30	68.0	

JAMS, FRUIT BUTTERS AND PRESERVES.

BY WM. ALLEN, W. G. HAYWOOD, AND F. C. LAMB.

Pure jams, fruit butters and preserves are made by boiling down the fruit specified with enough cane sugar (sucrose) to prevent fermentation. They contain the fruit pulp, and in the case of berries and other small fruit, the seeds and skins also. The presence of any other material than cane sugar and the fruit specified, except where it is stated on the package, so as to show that it is a mixture or compound, is an adulteration.

They should not, therefore, contain foreign gelatinous substances—glucose, saccharine, coal-tar and other dyes, artificial flavors or chemical preservatives.

Most of the added gelatinous substances, some artificial flavors, vegetable dyes, citric and tartaric acids, and pure glucose, are harmless in food, but are adulterants when the materials are sold as pure food products. On the other hand, glucose containing sulphurous acid, saccharine in considerable quantity, some artificial flavors, chemical preservatives, as formaldehyde, salicylic acid, benzoic acid and sulphurous acid, are injurious to health.

Many products claiming to be made from strawberries, raspberries, currants and other fruits, often contain very little or none of these fruits, but are made up of apples and some foreign materials, or wholly of foreign materials, artificially flavored, colored and preserved.

A product made entirely of ripe fruit should not contain starch in any appreciable amount.

RESULTS OF EXAMINATION.

Of this class of samples, twenty-five have been examined, and while some of them are good, they, like the jellies, are all adulterated in some way or other. They all contain glucose, while only two of them claim to contain it. Nineteen, or 76 per cent, of them contain formaldehyde and salicylic acid, which are objectionable chemical preservatives. Eleven, or 44 per cent, contain artificial coloring, some of which are more or less harmful. Three contain starch in considerable quantities.

METHODS OF EXAMINATION OF JELLIES, JAMS AND PRESERVES.

*Water.**—Into a flat-bottomed aluminum dish, 8 cm. in diameter, containing a glass stirring-rod, both of which have been weighed together, weigh two grams of the material, ten grams of ignited sand and 50 c. c. of water. Place the dish on the water bath and stir its contents until the jelly has completely dissolved. Evaporate the solution to dryness, stirring when the mass begins to stiffen to break up the lumps and mix with the sand. Heat the dish and contents in a drying cell at 100 degrees C. till the weight is constant.

By this method the drying is complete in nearly every case within fifteen hours, whereas in trials made without sand or without preliminary solution

* Food Products: Connecticut Agricultural Experiment Station, Part II, page 128, 1901.

in water, the jelly continues to lose in weight appreciably, even after drying several days.

*Ash.**—Burn five grams of the material below redness in a platinum dish.

Nitrogen.†—Determined by the Kjeldahl method.

*Polarization.**—Dissolve 13.024 grams (one-half the normal weight) of the material in about 80 c. c. of water. Add 3 c. c. of basic lead acetate and 2 c. c. of alumina cream, make up the volume to 100 c. c. and filter through a dry filter. Determine the rotatory power of the solution in a 200 mm. tube.

To 50 c. c. of the filtrate referred to above, add 5 c. c. concentrated C. P. hydrochloric acid. After thorough mixing, place in a cold water bath and heat quickly to 68 degrees C. After standing at that temperature for ten minutes, cool quickly, filter from lead chloride, if necessary, and examine in a 220 mm. tube, first at the room temperature, and finally at 86 degrees C.

Formaldehyde and Saticylic Acid.†—Place about 100 grams of the substance in a short-neck distilling flask, acidify with phosphoric acid, distill off with steam about 15 c. c. and set aside for formaldehyde; continue the distillation until 400 c. c. or 500 c. c. additional distillate has come over, which use for testing for salicylic acid.

Formaldehyde (*a*).—Place about 5 c. c. of the solution set aside for this purpose in a test tube and add to it a few drops of a one per cent aqueous solution of phenol; mix and carefully pour it on about the same amount of concentrated sulphuric acid in a test tube, holding the tube so the solutions will not mix. The presence of formaldehyde will be indicated by the formation of a crimson-colored ring at the plane of union of the two solutions.

(*b*) Add about 5 c. c. of the remaining distillate to an equal volume of pure milk in a porcelain casserole, and about 10 c. c. of concentrated hydrochloric acid, containing 1 c. c. of 10 per cent ferric chloride solution to each 500 c. c. of acid. Heat to 80 degrees C. or 90 degrees C. directly over the flame, giving it a rotary motion to break up the curd. A violet coloration indicates formaldehyde.

Salicylic Acid.†—Extract the distillate set aside for salicylic acid with about 25 c. c. of chloroform; evaporate the chloroform in a porcelain dish, take up with a few drops of hot water and drop into the one side a drop or two of dilute ferric chloride solution. If salicylic acid be present a purple or violet color will appear.

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* Food Products: Connecticut Agricultural Experiment Station, Part II, page 128, 1901.

† Methods of the Association of Official Agricultural Chemists.

ADULTERATED JAMS, FRUIT

Laboratory Number.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.
589	Strawberry Jam	F. H. Leggett & Co., New York, N. Y.	S. L. Whitener, Hickory, N. C.
591	Seal Brand, Plum Butter	P. J. Ritter Conserver Co., Philadelphia, Pa.	do
597	Pure Fruit Jam	F. H. Leggett & Co., New York, N. Y.	Cooper & Gill, Statesville, N. C.
604	Green Blackberry Jam	Van Lill Preserving Co., Baltimore, Md.	J. W. Scott, Greensboro, N. C.
606	Kentish Farm-house Jam	Frederick Chas. Gooding, Baltimore, Md.	do
592	Seal Quince Jam	P. J. Ritter Conserver Co., Philadelphia, Pa.	S. L. Whitener, Hickory, N. C.
452	Baldwin Apple Butter	Anderson Preserving Co., Camden, N. J.	E. B. Hackburn, New Bern, N. C
601	Delaware Apple Butter	Van Lill Preserving Co., Baltimore, Md.	W. B. Yoder, Hickory, N. C.
454	Plum Preserves	Saunders & Chambers, Richmond, Va.	A. E. Cummings, Kinston, N. C.
451	Mountain Rose Cherries	Githens, Rexsamer & Co, Philadelphia, Pa.	Barnes, Overman & Co., Wilson, N. C.
1041	Eagle Apple Butter	New Jersey Preserving Co., Camden, N. J.	E. T. Nadal, Wilson, N. C.
600	Delaware Apple Butter	Van Lill Preserving Co., Baltimore, Md.	S. L. Whitener, Hickory, N. C.
596	XX Brand, Strawberries	P. J. Ritter Conserver Co., Philadelphia, Pa.	do
593	Seal Brand Cherry Preserves.	do	do
448	Delaware Brand Preserved Plums.	Van Lill Preserving Co., Baltimore, Md.	Barnes, Overman & Co., Wilson, N. C.
449	Delaware Apple Butter	do	do
594	Extra Quality Orange Marmalade.	P. J. Ritter Conserver Co., Philadelphia, Pa.	S. L. Whitener, Hickory, N. C.
590	White Cherry Jam	F. H. Leggett & Co., New York, N. Y.	do
605	Raspberry Jam	Curtice, Bro. & Co., Rochester, N. Y	J. W. Scott & Co., Greensboro, N C.
459	Map'e Leaf Preserves	Williams Brothers & Charbonneaux, Detroit, Mich.	E. K. Willis, Washington, N. C.
1040	Cherry Jam	Anderson Preserving Co., Camden, N. J.	I. B. Fonville, Goldsboro, N. C.
450	Delaware Preserved Raspberries.	Van Lill Preserving Co., Baltimore, Md.	Barnes, Overman & Co., Wilson, N. C
602	Banquet Preserves	Austin, Nichols & Co., New York, N. Y.	J. W. Scott & Co., Greensboro, N. C.
451	Forest Brand Preserves	The Avery Preserving Co., Detroit, Mich.	T. F. Christian & Co., Greenville, N. C.
463	Monitor Brand Jam	Monitor Preserving Co., New York, N. Y.	M. Rosenthal, Raleigh, N. C.

BUTTERS AND PRESERVES.

Laboratory Number.	Quantity in Package.	Retail Price Per Package.	Gelatineous Matter.	Sugars.		Coloring Matter.	Preservative.
				Glucose.	Sucrose, Per Cent.		
		cts.					
589	1 pound	20		Glucose	7.50		
591	do	10	Starch	do	.80	Eosine	Formaldehyde.
597	1 quart	30		do	.20		Formaldehyde. Salicylic Acid.
604	1 pound	20		do	2.40		Formaldehyde.
606	do	25		do	2.00		Formaldehyde. Salicylic Acid.
592	do	10		do	7.50		Formaldehyde.
452	3 pounds	20		do		Alizarine	Formaldehyde.
601	1 quart	15		do		do	Salicylic Acid.
454	do	20		do			
451	1 pint	40		do			Formaldehyde.
1041	2 pounds	15		do		do	Formaldehyde.
600	1 quart	15	Starch	do		do	
596	1 pound	35			14.70		Formaldehyde.
593	do	25	Starch	do	4.40	Eosine	
448	2 pounds	25		do	2 80	do	Formaldehyde.
449	do	25		do	1.70	Alizarine	Formaldehyde.
594	1 pound	35		do	3.50		
590	do	20		do	16 60		Formaldehyde.
605	do	25		do	8.00		Salicylic Acid.
459	do	20		do	1.60	Marsilini, Orange	Formaldehyde.
1040	do	15		do	15.80		Formaldehyde.
450	2 pounds	25		do	8.60		
602	1 pound	40		do	13.50		Formaldehyde.
461	do	15		do	3.10	Coal-tar dye	Formaldehyde.
463	1 pint	25		do	1.70	Eosine	Formaldehyde.

ANALYSES OF JAMS, FRUIT BUTTERS AND PRESERVES.

Laboratory Number.	Claimed on Package or by Dealer to be—	Water—Per Cent.	Total Solids—Per Cent.	Ash—Per Cent.	Nitrogen—Per Cent.	Polarization.			
						Direct.	After Inversion	Temp. C.	After Inversion. Reading at 86°.
596	Strawberries	31.25	68 75	.38	.12	3.8	15.	32	1.0
593	Cherry Preserves	38.52	61.48	.67	.17	61.5	55.9	32	51.9
448	Plum Preserves				.16	123.4	119.4	30	102.2
449	Apple Butter	42.55	59.45	.51	.13	111.0	108.8	32	93.4
594	Orange Marmalade	25.35	74.65	.63	.11	85.5	81.0	32	71.5
590	Fruit Jam	32.25	67.25	.41	.11	26.7	5.5	32	15.8
605	Raspberry Jam	26.19	73.81	.37	.12	42.5	31.4	30	27.
459	Maple Leaf Preserves	28.16	71.84	.45	.90	107.0	105.0	30	92.
1040	Cherry Jam	25.77	74.23	.38	.10	83.8	63.5	31	60.
450	Raspberry Preserves	26.22	73 78	.66	.14	126.9	115.7	29	99.8
602	Bouquet Preserves, Melange	29.80	70.20	.43	.10	56.3	39.0	32	42.2
461	Tourist Preserves	26.05	73.95		.03	145.0	141.0	32	116.0
463	Fruit Jam	30.68	69.32	.52	.05	113.2	111.0	32	95.8
589	Fruit Jam	34.58	65.42	.54	.14	42.3	32.5	28	36.8
591	Plum Butter	37.55	62.45	.72	.09	12.3	11.2	28	20.1
597	Jam (Pure Fruit)	31.62	68.38	.41	.11	71.7	71.4	29	66.0
604	Blackberry Jam	36.67	63.33	.44	.09	49.	45.6	29	45.1
606	Kentish Farm-house Jam	22.08	77.92	.47	.09	53.	50.4	29	52.0
592	Quince Jam	33.32	66.68	.42	.05	97.8	88.3	29	79.1
452	Apple Butter	79.79	30.21	1.47	.12				
601	Apple Butler	58.83	41.17	.91	.11				
454	Plum Preserves	22.19	77.81	.67	.08				
451	Red Cherries	37.04	62.96	.25	.17				
1041	Apple Butter	70.63	29.37	1.19	.06				
600	Apple Butter	57.77	42.23	.62	.09				

VINEGAR.

BY W. M. ALLEN.

Vinegar is a liquid resulting from the acetous fermentation of vegetable materials in solution. It contains acetic acid, acetic ether, alcohol, sugar, gum, extractive matter, alkaline acetes, and tartrates, and variable amounts of other salts, depending on the substance from which it has been produced.*

Varieties of Vinegar.—The chief varieties of vinegar are, cider vinegar, wine vinegar, spirit vinegar, malt vinegar, and artificial vinegar.

Apple or Cider Vinegar is made by the fermentation of the juice of apples, and is the most desirable and choice kind of vinegar, because of its flavor, which is largely due to the acetic ether it contains. It commands the highest price on the market. It is often imitated and adulterated, and other kinds of vinegar are frequently sold under its good name.

Malt Vinegar.—Probably the larger part of the vinegar in this country is derived from the acetous fermentation of a wort, made from mixtures of malt and barley. Malt vinegar is of a decided brown color. It varies in strength, and contains usually 4.50 to 5 per cent of acetic acid.

Spirit Vinegar.—Spirit vinegar is made from dilute alcoholic solutions. It is usually the strongest vinegar on the market, has very little or no flavor, and is colorless or nearly so, unless artificially colored with caramel or other substances.

Wine Vinegar.—Wine vinegar is the chief vinegar in continental commerce. It is produced by the acetous fermentation of grape juice and inferior new wine; that made from white wine being most esteemed. The wine vinegars vary in color from pale yellow to red, and contain a large amount of tartaric acid.

Adulteration.—The chief adulterants of vinegar are water, mineral acid (usually sulphuric and hydrochloric), some metallic salts, and coloring matter.

RESULTS OF EXAMINATION.

Thirteen samples of vinegar have been carefully examined. It will be seen by reference to the table containing the resluts that seven of them claim to be cider vinegar, six of which appear to be true to name, the seventh, No. 1094, being, according to the best indications, a spirit vinegar, colored with caramel. No. 1097 was sold for a white wine vinegar, the next most desirable to a cider vinegar, but appears to be a spirit vinegar.

While this investigation has been limited to a few samples, it is gratifying to find that most of them are not misrepresented, but are sold under their true names. Only two are probably not what they are claimed to be. Of twenty-one samples examined in 1900, thirteen were misbranded and not sold under their true names. While caramel was added to four of these samples examined this year, they were not sold as apple cider vinegar. Noth-

*Blyth: Foods, Their Composition and Analysis.

ing injurious was found in any of them, and only one contained less than 4 per cent of acetic acid, the amount necessary for a vinegar of standard quality. A cider vinegar should have, in addition to at least four per cent of acetic acid, 1.5 to 2.5 per cent or more of apple solids.

METHODS OF EXAMINATION.

Acetic Acid.—10 c. c. of the sample is diluted with distilled water to 150 c. c and titrated with standard potassium hydroxide, using phenolphthalein as indicator.

Solids and Ash.—These were determined by evaporating in a platinum dish of water bath, drying in air bath at slightly over 100 degrees c., after which the residue was ignited for the ash.

RESULTS OF THE EXAMI-

Laboratory No.	Brand Name from Label.	Manufacturer or Wholesaler.	Retail Dealer.
1089	Elko	O. L. Gregory Vinegar Co., Richmond, Va.	J. T. Savage, Enfield, N. C.
1091	Apple Cider Vinegar	H. J. Heinz Co , Pittsburg, Pa	J. B. Green, Raleigh, N. C.
1092	Elko	O. L. Gregory Vinegar Co., Paducah, Ky.	D. T. Johnson, Raleigh, N. C.
1093	Pure Apple Cider Vinegar.	H. J. Heinz Co., Pittsburg, Pa	J. F. Matthews, Raleigh, N. C.
1094	Pure Boston made Apple Vinegar.	Oklahoma Vinegar Co., Fort Smith, Ok.	do
1095	Pure Apple Cider Vinegar.	H. J. Heinz Co., Pittsburg, Pa	A. N. Jones, Raleigh, N. C.
1096	do	do	Berry Renfrow, Raleigh, N. C.
1097	White Wine Vinegar	Jones, Louisville, Ky	do
1098	Apple Cider Vinegar		G. W. Goodwin, Raleigh, N. C.
1099	Pure Pickling Vinegar (Distilled).	H. J. Heinz Co., Pittsburg, Pa	do
1100	Pure Apple Cider Vinegar.	do	do
1101	Elko	O. L. Gregory Vinegar Co., Paducah, Ky.	A. C. Bostick & Co., Shelby, N. C.
1104	Elko, Double Refined	do	G. C. Haste, Edenton, N. C.

Caramel.—(*a*) Add to the vinegar a solution of lead subacetate in excess, filter, remove the lead from the filtrate with dilute sulphuric acid, and again filter. If caramel be present, the filtrate is brown, otherwise it is nearly colorless.

(*b*) Mix 10 c. c. of sample with about 25 c. c. of paraldehyde, and add alcohol until the three liquids become soluble. After standing twelve hours the caramel will separate as a sticky dark-brown precipitate, which, after washing with a little alcohol, has the characteristic bitter taste of caramel and reduces Fehling solution.

NATION OF VINEGAR.

Laboratory No.	Retail Price Per Gallon. Cents.	Total Solids Per Cent.	Ash. Per Cent.	Acetic Acid. Per Cent.	Coloring Matter.	The Indications are that this is—
1089	------------	1.50	.29	4.46	Caramel -----	Malt vinegar, colored.
1091	------------	2.18	.35	4.75	----------------	Cider vinegar.
1092	------------	1.12	.16	4.85	Caramel -----	Malt vinegar, colored.
1093	40	2.15	.27	5.43	----------------	Cider vinegar.
1094	40	.40	.12	4.63	Caramel -----	Spirit vinegar, colored.
1095	40	1.99	.38	5.53	----------------	Cider vinegar.
1096	40	2.00	.33	5.52	----------------	Cider vinegar.
1097	40	.31	.07	4.64	----------------	Spirit vinegar.
1098	40	1.68	.40	2.96	----------------	Cider vinegar, but weak.
1099	40	.25	.12	5.20	----------------	Spirit vinegar.
1100	40	1.97	.36	4.72	----------------	Cider vinegar.
1101	40	2.42	.24	4.62	----------------	Malt vinegar.
1104	------------	1.34	.09	4.85	Caramel -----	Malt vinegar, colored.

CONDIMENTS.

BY J. M. PICKEL.

BLACK PEPPER.

Black pepper is a climbing plant, grown in hot countries—Malacca, Java, Borneo, Sumatra, Guiana, Cayenne, and others. The fruit is gathered before maturity and dried, and, as it comes into commerce, consists, in the unground form, of black or reddish-black shrivelled berries.

Adulterants.—In the case of whole berries, there may be admixture of stems, leaves, worthless berries, dirt, etc., to such an extent as to constitute adulteration. In the case of ground pepper, which is especially liable to sophistication, common adulterants are ground corn, wheat or rice, ground cocoanut shells, pepper husks, sweepings, earthy matter.

Results of Examination.—The samples of whole berries were found fairly clean and up to standard in chemical composition. Ground samples Nos. 885 and 898 showed considerably more ash and less ether extract than is usual with genuine pepper, and are to be regarded as inferior articles; Nos. 896 and 902 are quite deficient in ether extract, containing less than half the average amount in good pepper; they showed under the microscope excessive quality of black husk-like particles.

WHITE PEPPER.

White pepper is prepared from black pepper by the removal of the outer husk from the latter. It differs in composition from black pepper in that it contains only about half as much ash and appreciably less volatile and non-volatile ether extract.

Adulterants.—Rice, wheat and corn products, ground olive stones and carbonate of lime are among the adulterants that have been reported.

Results of Examination.—No adulteration; only two samples were examined.

RED PEPPER.

Adulterants.—Yellow corn meal, wheat and rice flour, turmeric, husks of mustard, and mineral coloring matter are among those reported.

Results of Examination.—Three samples were examined. No. 864 is of inferior quality, as shown by the low ether extract. No. 907, the only one of the red peppers claiming to be cayenne, contains excessively high ash and low ether extract, and is practically worthless. It is apparently an exhausted pepper waste.

ALLSPICE.

Allspice, or pimento, very frequently but erroneously called *spice*, is the fruit or berry of an evergreen tree, native of the West Indies.

The Adulterants are clove stems, cocoanut shells, yellow corn, mineral matter, etc.

Results of Examination.—Four samples of powdered allspice were examined. No. 912 is low in volatile ether extract. Nos. 875, 901, 893 are high in ash and low in both volatile and non-volatile ether extract. They were adulterated with extraneous matter, as indicated by the shell- or husk-like particles seen under the microscope.

CLOVES.

Cloves are the flower buds of an evergreen tree of the tropics.

Adulterants.—Clove stems, allspice, cocoanut shell, and wheat product are some of its adulterants.

Results of Examination.—Two samples of powdered cloves were examined. Both showed excessive amounts of ash and great deficiency of volatile ether extract—only about one-third of the average of genuine cloves. They were most likely a waste product from which the oil of cloves had been extracted, or contained such a product.

NUTMEG AND MACE.

Nutmegs are the dried kernels of the fruit of the nutmeg tree, which grows in the East, mainly in the Banda Islands. Mace is the fleshy mantle or covering of the kernel. There are several varieties of nutmeg (and also of mace). True nutmeg (from the myristica fragrans) is of a more roundish, less elongated form than the inferior, but larger, long or Macassar nutmeg.

The Adulterants are lime (which is quite generally used to prevent depredation by insects) when excessive, nutmeg shells, insect-eaten nutmegs, cereals and cereal refuse.

Results of Examination.—Two samples (powdered) were examined. One (No. 11) contains a large excess of ash, along with a great deficiency of ether exract. Under the microscope it showed a paucity of starch cells. It doubtless consists in insect-eaten kernels ground up. The two samples of ground mace examined were, as indicated by the large ether extract, wholly or in part of the Macassar or Bombay varieties.

GINGER.

Ginger is a native of the warmer parts of Asia, where, as also in other warmer countries, notably Jamaica, it is cultivated. It is the root of the plant that is used as a condiment. The roots come into commerce both in the scraped and unscraped form. Frequently also they are coated with lime or gypsum as a protection against insects.

The Adulterants are exhausted ginger, rice, wheat and potato flour, cayenne, mustard hulls, turmeric, mineral matter, etc.

Results of Examination.—Two samples of powdered ginger were examined. No. 899 was found to be adulterated by mineral matter, as shown by its great excess of ash and its low contents of ether extract.

CINNAMON.

Cinnamon bark, as found in commerce, has usually been deprived of its outer corky coat and of its inert layer, and is therefore very thin. The

RESULTS OF THE EXAMINATION

Laboratory Number.	Name of Article of Brand from Label.	Manufacturer or Wholesaler.	Bought of—
865	Black Pepper, whole berries.	Carhart Bros., New York	Barnes, Overman & Co., Wilson, N. C.
873	do	Austin, Nichols & Co., New York	I. B. Fonville, Goldsboro, N. C
880	do	Sanders & Chambers, Richmond, Va.	A. E. Cummings, Kinston, N. C.
897	do	Pekins' Spice Co., Cincinnati, O.	J. L. Starkey & Bro., Greenville, N. C.
905	do	F. H. Leggett & Co., New York	E. K. Willis, Washington, N. C.
863	Black Pepper, ground.	Patapsco Mills, Baltimore, Md	Barnes, Overman & Co., Wilson, N. C.
874	do	Austin, Nichols & Co., New York	I. B. Fonville, Goldsboro, N. C
877	do	Frank Tea and Spice Co., Cincinnati, Ohio.	do
882	do	Sanders & Chambers, Richmond, Va.	A. E. Cummings, Kinston, N. C.
884	do	F. H. Leggett & Co., New York	E. B. Hackburn, New Bern, N. C.
885	do	do	do
895	do	Austin, Nichols & Co., New York	J. L. Starkey & Bro., Greenville, N. C.
896	do	do	do
898	do	Pekins' Spice Co., Cincinnati, O.	do
902	do	E. A. Saunders & Son, Richmond, Va.	T. F. Christian & Co., Greenville, N. C.
904	do	F. H. Leggett & Co., New York	E. K. Willis, Washington, N. C.
910	do	James Hukin & Co., Cincinnati, Ohio.	do
903	do	Hukin's Spice Co., Cincinnati, O.	do
883	do	Howard & Co., New York	E. B. Hackburn, New Bern, N. C.
887	White Pepper, ground.	F. H. Leggett & Co., New York	do
913	do	Austin, Nichols & Co., New York	M. Rosenthal, Raleigh, N. C
864	Red Pepper, ground	Carhart Bros., New York	Barnes, Overman & Co., Wilson, N. C.
886	do	Howard & Co., New York	E. B. Hackburn, New Bern, N. C.
907	do	Hukin's Spice Co., Cincinnati, O	E. K. Willis, Washington, N. C.
876	Spice, whole berries.	Austin, Nichols & Co., New York	I. B. Fonville, Goldsboro, N. C
881	do	Sanders & Chambers, Richmond, Va.	A. E. Cummings, Kinston, N. C.
900	do	Austin, Nichols & Co., New York	J. L. Starkey & Bro., Greenville, N. C.
912	Spice, ground	Hukin's Spice Co., Cincinnati, O.	E. K. Willis, Washington, N. C.
875	do	Austin, Nicnols & Co., New York	I. B. Fonville, Goldsboro, N. C
901	Allspice, ground	do	J. L. Starkey & Bro., Greenville, N. C.
893	do	F. H. Lèggett & Co., New York	E. B. Hackburn, New Bern, N. C.
867	Cloves, whole	R. C. Williams & Co., New York.	Barnes, Overman & Co., Wilson, N. C.
868	Cloves, ground	Bennett, Sloan & Co., New York	do
889	do	F. H. Leggett & Co., New York	E. B. Hackburn, New Bern, N. C.

OF CONDIMENTS.

Laboratory Number.	Date of Purchase. 1900.	Retail Price Per Pound Cents.	Ash.		Ether Extract.		Remarks.
			Total Per Ct.	Insoluble in 190° Hydrochloric Acid.	Volatile. Pr. Ct.	Non-Volatile. Pr. Ct.	
865	July 12	20	5.73	------------	--------	10.29	Not found adulterated.
873	July 14	40	4.89	------------	--------	7.82	Do.
880	July 18	25	4.17	------------	--------	8.33	Do.
897	July 20	20	4.55	------------	--------	7.98	Do.
905	July 21	20	4.46	------------	--------	8.60	Do.
863	July 12	20	4.08	------------	--------	8.45	Do.
874	July 14	40	4.78	------------	--------	8.08	Do.
877	July 14	--------	4.47	------------	--------	7.39	Do.
882	July 18	40	3.73	------------	--------	6.42	Do.
884	July 19	40	5.22	------------	--------	5.49	Do.
885	July 19	30	7.00	1.59	--------	4.52	Inferior.
895	July 20	80*	5.52	0.49	--------	8.20	Not found adulterated.
896	July 20	32*	4.81	------------	--------	2.18	Adulterated with husks.
898	July 20	29	7.81	------------	--------	4.88	Inferior.
902	July 20	15	4.87	------------	--------	2.73	Adulterated with husks.
904	July 21	40*	7.52	1.32	--------	8.47	Not found adulterated.
910	July 21	40*	6.57	1.20	--------	6.52	Do.
903	July 21	40*	4.45	------------	--------	6.50	Do.
883	July 19	26⅔*	6.67	1.19	--------	8.22	Do.
887	July 19	40	1.85	------------	--------	7.29	Do.
913	Aug. 4	--------	2.97	------------	--------	7.72	Do.
864	July 12	40	3.60	------------	--------	12.25	Inferior.
886	July 19	40	5.53	------------	--------	19.80	Not found adulterated.
907	July 21	40†	9.64	1.31	--------	3.57	Adulterated with exhausted pepper.
876	July 14	40	4.70	------------	3.68	6.46	Not found adulterated.
881	July 18	25	4.45	------------	3.19	5.80	Do.
900	July 20	--------	4.71	------------	4.62	7.06	Do.
912	July 21	40	4.63	------------	1.79	4.47	Inferior.
875	July 14	40	5.35	------------	2.54	3.71	Adulterated with husks.
901	July 20	--------	6.27	0.61	1.30	2.05	Do.
893	July 19	40	5.40	0.08	3.31	1.82	Do.
867	July 12	--------	6.35	------------	16.17	5.43	Not found adulterated.
868	July 12	--------	7.01	0.06	6.39	5.33	Adulterated with exhausted cloves.
889	July 19	40	8.79	0.48	7.79	4.52	Do.

* At these rates in small boxes (1½ to 3 ounces). † At this rate in 2-ounce packages.

RESULTS OF THE EXAMINATION

Laboratory Number.	Name of Article or Brand from Label.	Manufacturer or Wholesaler.	Bought of—
872	Nutmeg, whole	R. C. Williams & Co., New York	Barnes, Overman & Co., Wilson, N. C.
890	Nutmeg, ground	F. H. Leggett & Co., New York	E. B. Hackburn, New Bern, N. C.
911	do	Hukin's Spice Co., Cincinnati, O.	E. K. Willis, Washington, N. C.
869	Mace, whole	Bennett, Sloan & Co., New York.	Barnes, Overman & Co., Wilson, N. C.
892	Mace, ground	F. H. Leggett & Co., New York	E. B. Hackburn, New Bern, N. C.
906	do	Hukin's Spice Co., Cincinnati, O.	E. K. Willis, Washington, N. C.
914	Ginger, whole, bleached.	Austin, Nichols & Co., New York	W. B. Mann, Raleigh, N. C
894	Ginger, ground	F. H. Leggett & Co., New York	E. B. Hackburn, New Bern, N. C.
899	do	Austin, Nichols & Co., New York	J. L. Starkey & Bro., Greenville, N. C.
870	Cinnamon, ground	Carhart Bros., New York	Barnes, Overman & Co., Wilson, N. C.
888	do	F. H. Leggett & Co., New York	E. B. Hackburn, New Bern, N. C.
520	Mustard, flour	R. C. Williams & Co., New York.	A. E. Cummings, Kinston, N. C.
521	do	John R. Cary & Co., Richmond, Va.	Barnes, Overman & Co., Wilson, N. C.
528	do	The A. Colburn Co., Philadelphia, Pa.	M. Rosenthal, Raleigh, N. C
530	do	McCormick Co., Baltimore, Md.	B. W. Upchurch, Raleigh, N. C.
531	do	Anco Spice Mill, New York	J. R. Ferrall & Co., Raleigh, N. C.
533	do	F. H. Leggett & Co., New York	E. B. Hackburn, New Bern, N. C.
535	do	do	E. K. Willis, Washington, N. C.
536	do	do	E. B. Hackburn, New Bern, N. C.
878	do	Austin, Nichols & Co., New York	I. B. Fonville, Goldsboro, N. C.
871	Celery Seed	Carhart Bros., New York	Barnes, Overman & Co., Wilson, N. C.

OF CONDIMENTS—Continued.

Laboratory Number.	Date of Purchase. 1900.	Retail Price Per Pound Cents.	Ash. Total. Per Ct.	Ash. Insoluble in 190° Hydrochloric Acid.	Ether Extract. Volatile. Pr. Ct.	Ether Extract. Non-Volatile. Pr. Ct.	Remarks.
872	July 12	80	2.44	0.07	--------	40.85	Not found adulterated.
890	July 19	$1.00	4.13	0.05	--------	28.55	Do.
911	July 21	40†	7.37	0.17	--------	14.75	Inferior.
869	July 12	60	2.60	------------	6.94	24.21	Not found adulterated.
892	July 19	$1.00	4.35	------------	6.43	36.03	Macassar or Bombay mace.
906	July 21	80	2.57	------------	5.72	42.89	Do.
914	Aug. 4	--------	8.00	------------	--------	5.15	Not found adulterated.
894	July 19	40	5.57	------------	--------	5.60	Do.
899	July 20	--------	22.22	0.48	--------	3.24	Adulterated with mineral matter.
870	July 12	60	6.07	0.20	--------	1.20	Not found adulterated.
888	July 19	40	4.70	0.35	--------	1.30	Do.
520	July 17	60*	3.44	------------	--------	8.19	Adulterated with wheat product and turmeric.
521	July 12	60*	2.87	------------	--------	7.14	Do.
528	Aug. 4	60*	6.39	------------	--------	20.10	Not found adulterated.
530	Aug. 4	40	5.63	------------	--------	11.42	Adulterated with rice product.
531	Aug. 4	80	6.97	------------	--------	20.20	Not found adulterated.
533	July 19	80	4.27	------------	--------	38.42	Do.
535	July 21	1.00*	5.66	------------	--------	24.67	Do.
536	July 19	60*	5.25	------------	--------	28.09	Do.
878	July 14	40*	6.10	------------	--------	17.77	Inferior.
871	July 12	80	9.82	------------	--------	18.00	Not found adulterated.

* At this rate in small packages of 2 to 4 ounces.

closely related cassia, not having usually been thus treated, is much thicker and rougher.

The Adulterants are cassia (substituting or replacing cinnamon), cedar sawdust, roasted hulls, oil meals, mineral and coloring matter.

Results of Examination.—No adulteration found; two samples (powdered) were examined.

MUSTARD.

Mustard flour is prepared by grinding the seed and removing the husks by bolting. Black and white mustard seed differ in composition. The former when mixed with water develops a volatile oil, and is much more pungent than the white, which does not develop this oil. Both—the white more than the black—contain a bitter principle which contributes to the mustard flavor. Both contain as much as thirty or even more per cent of fixed oil which adds nothing to their pungency. It is quite common to remove, by pressure, a part of this oil before grinding the seed. Its removal improves the keeping quality of the flour, and is not usually thought objectionable. Another custom is that of adding wheat flour; this is also for the purpose of improving the keeping quality, but as it dilutes and weakens the mustard, is regarded as adulteration.

Adulterants.—Wheat flour, gypsum, turmeric, clay, cayenne, buckwheat, rice, mustard husks, etc.

Results of Examination.—Nine samples of mustard flour were examined. Nos. 520 and 521 were adulterated with wheat product and turmeric, and No. 530 with rice product.

METHODS OF ANALYSIS.

Ash.—Two grams of substance were incinerated at first below red heat, and afterwards, when thought necessary, at bright red heat for total ash. The ash thus obtained was boiled in 25 c. c. of ten per cent hydrochloric acid, thrown into a Gooch filter, washed, dried, and, in case the incineration had left particles of carbon, glowed—for ash insoluble in 10 per cent hydrochloric acid.

Ether Extract.—Two grams of substance were extracted 20 hours in a Soxhlet extractor with absolute ether; the extract was transferred to a tarred capsules, the ether allowed to volatilize at room temperature, the residue dried 18 hours in desiccator over sulphuric acid and weighed. The extract was then heated one hour at 100 degrees in water-oven and then four to six hours at 110 degrees and weighed; this weight gave the non-volatile extract, which subtracted from the previous weighing (total extract) gave the volatile. In case only the non-volatile extract was desired, the previous drying over sulphuric acid was omitted.

All substance was previously passed through a seive with round holes 1-25 inch in diameter.

CABBAGE SNAKES.

BY GERALD M'ARTHY.

The sea-serpent of mendacious renown seems to have been forced out of business this year by a land serpent which has located in the western part of North Carolina, where it has taken to frightening the owners of cabbage patches. Many stories have been published concerning the deadly venom of this creature, usually referred to as the "Cabbage Snake." Several of these "serpents" have been caught and sent to the North Carolina Department of Agriculture for identification. In every case these have proved to be the common and harmless water-worm, or "Hair Snake"—*Gordius variabilis.*

Snakes and serpents belong to the backboned series of animals. This creature is a nematode worm belonging far down in the scale of created beings. It has a soft, boneless body, with only rudimentary organs. It does not bite or chew, but absorbs its food in liquid form through any and every part of its body. It is normally an internal parasite of grasshoppers and other insects. Its presence in cabbage-heads is rare and accidental, due to the previous abundance of insects upon the plants. The Gordius worms are never found parasitic upon humans or vertebrate animals. The stories concerning the deaths supposed to have been caused by these worms are untrue and ridiculous! There is no venom in them. They may be eaten raw or cooked without any danger to the eater.

The serious part of these stories is that such publications may cause considerable loss by preventing people from eating the cabbage they have raised or purchased. Such fears are wholly groundless. The worms are not common, and when they do occur upon cabbage, they will do no harm to any one eating the vegetable. They are at worst no more hurtful than the worms so plentiful in apples and peaches some seasons.

The so-called cabbage worm, or *Gordius variabilis*, is a slender, white-bodied worm, from four to twelve inches long, and about as thick as an ordinary knitting-needle.

It is hoped that those newspapers which have published the misleading stories concerning this worm, will re-publish this refutation, and thus help to prevent needless loss of good food.

CLOSE SEASONS FOR GAME IN NORTH CAROLINA.

COMPILED BY T. S. PALMER AND H. W. OLDS.

The following table shows the close seasons for game in each county of North Carolina, and is designed to bring together in convenient form the numerous local seasons that prevail in this State. In its preparation much help has been derived from the Synopsis of the Game Laws of North Carolina, published by the State Board of Agriculture.

Special attention is called to the following restrictions on shipment:

The *State laws* of North Carolina prohibit shipment of quail from the State and impose various other restrictions on shipment of game from several of the counties.

The *Federal law* prohibits shipment from the State of game killed during the close seasons mentioned below. Penalty, fine not exceeding $200. (Carrier and consignee may also be liable.)

The *Federal law* also prohibits shipment of game from the State *at any time* in packages not marked so that the name and address of shipper and nature of contents may be readily ascertained by inspection of the outside of the package. Penalty, fine not exceeding $200. (Carrier and consignee may also be liable.)

Details in regard to shipment, sale, and licenses are contained in Farmers' Bulletin No. 160, which may be had free upon application to the Secretary of Agriculture, Washington, D. C.

The first date of the close season and the first date of the open season are given, hence open seasons may be readily found by reversing the dates. Thus, if the close season is Dec. 1—Sept. 1, the open season will be Sept. 1—Dec. 1.

NORTH CAROLINA. *

Counties.	Deer.	Quail. (Partridge.)	Turkey.
Alamance	Jan. 1—Oct. 1	Mar. 15—Nov. 1	Mar. 15—Nov. 1
Alexander	Jan. 1—Oct. 1	Mar. 15—Nov. 1	Mar. 15—Nov. 1
Alleghany	Jan. 1—Oct. 1	Mar. 15—Nov. 1	Mar. 15—Nov. 1
Anson	Jan. 1—Oct. 1	Mar. 15—Nov. 1	Mar. 15—Nov. 1
Ashe	Jan. 1—Oct. 1	Mar. 15—Nov. 1	Mar. 15—Nov. 1
Beaufort	----------	Mar. 20—Oct. 15	Mar. 15—Nov. 1
Bertie	Feb. 1—Oct. 1	Mar. 1—Nov. 1	Mar. 1—Nov. 1
Bladen	Jan. 1—Oct. 1	Mar. 15—Nov. 1	Mar. 15—Nov. 1
Brunswick	Feb. 15—July 15	Mar. 15—Nov. 1	Mar. 15—Nov. 1
Buncombe	Jan. 1—Oct. 1	Mar. 15—Nov. 1	Mar. 15—Nov. 1
Burke	Jan. 1—Oct. 1	Mar. 15—Nov. 1	Mar. 15—Nov. 1
Cabarrus	Jan. 1—Oct. 1	Mar. 1—Nov. 15	Mar. 1—Nov. 1

CLOSE SEASONS FOR GAME IN NORTH CAROLINA—Continued.

Counties.	Deer.	Quail. (Partridge.)	Turkey.
Caldwell	Until Mar., 1905	Mar. 15—Nov. 1	Mar. 15—Nov. 1
Camden		Mar. 1—Nov. 1	Mar. 15—Nov. 1
Carteret (Bogue Banks)		Until Mar., 1905	Until March, 1905
Caswell	Until Feb., 1907	Mar. 15—Nov. 1	Mar. 15—Nov. 1
Catawba	Jan. 1—Oct. 1	Mar. 15—Nov. 1	Mar. 15—Nov. 1
Chatham	Jan. 1—Oct. 1	Mar. 1—Nov. 1	Mar. 1—Nov. 1
Cherokee	Feb. 15—Aug. 15		May 10—Oct. 10
Chowan		Mar. 15—Nov. 1	Mar. 15—Nov. 1
Clay	Until 1902		
Cleveland	Jan. 1—Oct. 1	Mar. 15—Nov. 1	Mar. 15—Nov. 1
Columbus	Jan. 1—Oct. 1†		
Craven		Mar. 15—Nov. 1	
Cumberland	Jan. 1—Oct. 1	Mar. 15—Nov. 1	
Currituck	Jan. 1—Oct. 1‡	Mar. 1—Nov. 1	Mar. 15—Nov. 1
Dare	Mar. 1—Oct. 15	Mar. 1—Oct. 15	
Davidson	Jan. 1—Oct. 1	Mar. 1—Nov. 15	Mar. 1—Nov. 15
Davie	Jan. 1—Oct. 1	Mar. 15—Nov. 1	Mar. 15—Nov. 1
Duplin		Mar. 15—Nov. 1	
Durham	Jan. 1—Oct. 1	Mar. 15—Nov. 1	Mar. 15—Nov. 1
Edgecombe		Mar. 15—Nov. 1	Mar. 15—Nov. 1
Forsyth	Jan. 1—Oct. 1	Mar. 15—Nov. 1	Mar. 15—Nov. 1
Franklin	Jan. 1—Oct. 1	Mar. 15—Nov. 1	Mar. 15—Nov. 1
Gaston	Jan. 1—Oct. 1	Mar. 15—Nov. 1	Mar. 15—Nov. 1
Gates		Mar. 15—Nov. 1	Mar. 15—Nov. 1
Graham	Feb. 15—Aug. 15		
Granville	Jan. 1—Oct. 1	Mar. 1—Oct. 15	Mar. 1—Oct. 15
Greene		Mar. 15—Nov. 1	Mar. 15—Nov. 1
Guilford	Jan. 1—Oct. 1	Mar. 15—Nov. 1	Mar. 15—Nov. 1
Halifax		Mar. 15—Nov. 1	Mar. 15—Nov. 1
Harnett	Jan. 1—Oct. 1	Mar. 15—Nov. 1	Mar. 15—Nov. 1
Haywood	Jan. 1—Oct. 1	Mar. 15—Nov. 1	Mar. 15—Nov. 1
Henderson	Jan. 1—Oct. 1	Feb. 15—Nov. 15	Feb. 15—Nov. 15
Hertford		Mar. 15—Nov. 1	Mar. 15—Nov. 1
Hyde	Feb 15—Aug. 1¶	Mar. 20—Oct. 15	Mar. 15—Nov. 1
Iredell	Jan. 1—Oct. 1	Mar. 15—Nov. 1	Mar. 15—Nov. 1
Jackson	Feb. 15—Aug. 15	Mar. 15—Nov. 1	Mar. 15—Nov. 1
Johnston		Mar. 15—Nov. 1	Mar. 15—Nov. 1
Jones			
Lenoir	Jan. 1—Oct. 1	Mar. 15—Nov. 1	Mar. 15—Nov. 1

CLOSE SEASONS FOR GAME IN NORTH CAROLINA—Continued.

Counties.	Deer.	Quail. (Partridge.)	Turkey.
Lincoln	Jan. 1—Oct. 1	Mar. 15—Nov. 1	Mar. 15—Nov. 1
McDowell	Jan. 1—Oct. 1	Mar. 15—Nov. 1	Mar. 15—Nov. 1
Macon	Until 1902		May 1—Oct. 15
Madison	Jan. 1—Oct. 1	Mar. 15—Nov. 1	Mar. 15—Nov. 1
Martin		Mar. 15—Nov. 1	May 1—Jan. 1
Mecklenburg	Jan. 1—Oct. 1	Jan. 10—Dec. 1	Feb. 1—Nov. 15
Mitchell	Jan. 1—Oct. 1	Mar. 15—Nov. 1	Mar. 15—Nov. 1
Montgomery	Until 1906	Mar. 1—Nov. 1	Mar. 1—Nov. 15
Moore	Jan. 1—Oct. 1	Mar. 15—Nov. 1	Mar. 15—Nov. 1
Nash	Jan. 1—Oct. 1	Mar. 15—Nov. 1	Mar. 15—Nov. 1
New Hanover	Jan. 1—Oct. 1	Apr. 1—Oct. 15	Mar. 15—Nov. 1
Northampton		Mar. 15—Nov. 1	Mar. 15—Nov. 1
Onslow			
Orange	Jan. 1—Oct. 1	Mar. 15—Nov. 1	Mar. 15—Nov. 1
Pamlico	Mar. 1—Sept. 1	Mar. 1—Sept. 1	Mar. 1—Sept. 1
Pasquotank		Mar. 1—Nov. 1	Mar. 15—Nov. 1
Pender	Feb. 1—Oct. 1	Mar. 15—Nov. 1	Feb. 1—Oct. 1
Perquimans		Mar. 15—Nov. 1	Mar. 15—Nov. 1
Person	Jan. 1—Oct. 1	Mar. 15—Nov. 1	Mar. 15—Nov. 1
Pitt		Mar. 15—Nov. 1	Mar. 15—Nov. 1
Polk	Jan. 1—Oct. 1	Mar. 15—Nov. 1	Mar. 15—Nov. 1
Randolph	Jan. 1—Oct. 1	Mar. 1—Nov. 15	Feb. 1—Dec. 1
Richmond	Feb. 15—Aug. 15	Apr. 1—Oct. 15	Apr. 1—Oct. 15
Robeson	Jan. 1—Oct. 1	Mar. 15—Nov. 1	Mar. 15—Nov. 1
Rockingham	Jan. 1—Oct. 1	Mar. 15—Nov. 1	Mar. 15—Nov. 1
Rowan	Jan. 1—Oct. 1	Feb. 2—Dec. 1	Feb. 2—Dec. 1
Rutherfordton	Jan. 1—Oct. 1	Mar. 15—Nov. 1	Mar. 15—Nov. 1
Sampson	Jan. 1—Oct. 1	Mar. 15—Nov. 1	Mar. 15—Nov. 1
Scotland	Feb. 15—Aug. 15	Apr. 1—Oct. 15	Apr. 1—Oct. 15
Stanly	Jan. 1—Oct. 1	Mar. 15—Nov. 1	At all times.
Stokes	Jan. 1—Oct. 1	Mar. 15—Nov. 1	Mar. 15—Nov. 1
Surry	Jan. 1—Oct. 1	Feb. 1—Dec. 1	Mar. 15—Nov. 1
Swain	Feb. 15—Aug. 15		
Transylvania	Jan. 1—Oct. 1	Mar. 15—Nov. 1	Mar. 15—Nov. 1
Tyrrell	Feb. 1—Oct. 15	Mar. 1—Oct. 15	
Union	Jan. 1—Oct. 1	Mar. 15—Nov. 1	Mar. 15—Nov. 1
Vance	Jan. 1—Oct. 1	Mar. 15—Oct. 15	Mar. 15—Oct. 15
Wake	Jan. 1—Oct. 1	Mar. 15—Nov. 1	Mar. 15—Nov. 1
Warren	Jan. 1—Oct. 1	Mar. 15—Oct. 10	Mar. 15—Oct. 10

CLOSE SEASONS FOR GAME IN NORTH CAROLINA—Continued

Counties.	Deer.	Quail. (Partridge).	Wild Turkey.
Washington		Mar. 15—Nov. 1	Mar. 15—Nov. 1
Watauga	Jan. 1-Oct. 1	Mar. 15—Nov. 1	Mar. 15—Nov. 1
Wayne		Mar. 15—Nov. 1	Mar. 15—Nov. 1
Wilkes	Jan. 1—Oct. 1	Mar. 15—Nov. 1	Mar. 15—Nov. 1
Wilson		Feb. 1—Nov. 15	Feb. 1—Nov. 1
Yadkin	Jan. 1-Oct. 1	Mar. 15—Nov. 1	Mar. 15—Nov. 1
Yancey	Jan. 1—Oct. 1	Mar. 15—Nov. 1	Mar. 15—Nov. 1

*The following game is also protected in North Carolina:

Squirrel: Bertie, Martin, March 1—August 15; Pamlico, March 1—September 1; Pasquotank, March 1—October 1.

Opossum: Alamance, Anson, Caswell, Chatham, Franklin, Gaston, Guilford, Halifax, Mecklenburg, Moore, Orange, Wake, Warren, February 1—October 1; Pamlico, March 1—September 1.

Pheasant: Cherokee, May 10—October 10; Currituck, to April 1, 1906; Henderson, February 15—November 15; Rowan, February 1—December 1.

Woodcock: Randolph, March 1—November 15; Rowan, February 2—December 1.

Snipe: Henderson, February 15—November 15.

Marsh Hen, Curlew, and other shore birds: New Hanover, April 1—September 1.

Wild Fowl: Brunswick, New Hanover, March 10—November 1; Carteret, January 1—December 1; Currituck, April 1—November 10; Henderson, February 15—November 15.

† Lake Waccamaw.

‡ On North River side of Poplar Branch Township, March 1—September 21.

¶ Except near Mattamuskeet Lake.

GOOD ROADS.

THE LEGISLATURE AND THE CONVICTS.

The General Assembly of North Carolina which will convene at Raleigh in January will consider the ways and means of bettering the State's social, industrial and educational condition. One subject that will occupy the minds of some of its most progressive members will be the disposition of the State's convicts in such manner as will affect our section most beneficially. There is a strong sentiment in favor of putting all of the convicts to work upon our public roads, and in preparing stone and other road material in order that the counties of the State that are so anxious to progress along this line may have some encouragement from the Commonwealth. This will be an investment yielding a handsome return, both to the present race and to posterity.

The following clipping shows some of the advantages of such a system of convict employment:

Short-term inmates of the local penitentiary are being employed at breaking stone for road building. One result is that the county is saving 20 cents on each cubic yard of metal. Another, is that the number of tramps and other petty offenders in Erie County is growing beautifully less, the "sons of rest" not relishing work in the quarries. A third is that there is a very perceptible improvement in the physical and moral condition of the convicts, because of their systematic employment at a healthful occupation.

Unhappily, it has to be recorded that such employment of the convicts is strongly opposed by the labor unions, and their employment on the highways in the actual work of road building has, through such influences, been prevented. Such an attitude on the part of the labor unions is difficult to understand, save on the principle of the dog in the manger. Work on the public roads is something which free workingmen, as a rule, are most reluctant, if not positively unwilling, to perform. A serious obstacle to good road construction in some places has been this difficulty of finding men willing to do the work. Just why this should be so we can not tell, but so it is. Surely it is unreasonable for men in the labor unions to object to convicts doing work which they will not do themselves.

There is, moreover, the general principle of the desirability of giving the convicts systematic work, and preferably hard work in the open air, such as that at road building. It is desirable to do so for their physical, mental and moral welfare. Surely, the labor unions do not wish to have inmates of penitentiaries still more degraded in body and mind. That would be a reversion to mediaeval barbarism. The humane modern principle is that the penitentiary is, as far as possible, to be a reformatory. Nor is the question of expense to be ignored. Is it conceivable that labor unions would rather be taxed to support prisons in idleness than have the latter set to earning their own living?

HOW AN IMPASSABLE CLAY HILL WAS FIXED IN WILSON COUNTY, NORTH CAROLINA.

The following note from the Chairman of the Wilson County Board of Commissioners will be interesting to the dwellers in the eastern part of our State:

"The hill had given our County Commissioners much trouble, and was specially dreaded every winter, as it was no unusual thing to see wagons to their hubs in the mud. One set of Commissioners made a plank bed about ten feet wide that was unsatisfactory.

"Upon the modern idea of wide road construction, our supervisor graded the hill and made it so easy that one can trot from the base to the top. He made the road 40 feet wide, and in cutting down and widening the road he took all of the top soil and banked it up. After the grade was completed, he then put 8 or 10 inches of top soil on the clay, and he has a highway now that makes horses caper like men free from care. This impassable hill passed through last winter without even getting muddy. And I am sure it is fixed for years to come."

SOME SUGGESTIONS FOR THE DRAINAGE OF OUR PUBLIC ROADS.

Under the above heading each week will be included in this paper some practical information for our road supervisors and overseers, and for our farmers and others who are interested in bettering the condition of the roadways in the counties of North Carolina. From a recent government publication we take the following:

Water Breaks.—In order to prevent the washing out of earth roads on hills it sometimes becomes necessary to construct water breaks; that is, broad shallow ditches arranged so as to catch the surface water and carry it each way into the side ditches. Such ditches retard traffic to a certain extent, and often result in overturning vehicels; consequently they should never be used until all other means have failed to cause the water to flow into the side channels; neither should they be allowed to cross the entire width of the road diagonally, but should be constructed in the shape of the letter V. This arrangement permits teams following the middle of the road to cross the ditch squarely and thus avoid the danger of overturning. These ditches should not be deeper than is absolutely necessary to throw the water off the surface, and the part of the center should be the shallowest.

Unfortunately farmers and road masters have a fixed idea that the one way to prevent hills, long and short, from washing is to heap upon them quantities of those original tumular obstructions known as "thank you ma'ms," "breaks" or "hummocks," and the number they can squeeze in on a single hill is positively astonishing.

Surface Drainage.—Where the road is constructed on a grade or hill, the slope from the centre to the sides should be slightly steeper than that on the level road. The best cross-section for roads on grades is the one made up from two plane surfaces sloping uniformly from the centre to the sides. This is done so as to avoid the danger of overturning near the side ditches, which

would necessarily be incerased if the elliptical form were used. The slope from the centre to the sides must be steep enough to lead the water into the side ditches instead of allowing it to run down the middle of the road. Every wheel track on an inclined roadway becomes a channel for carrying down the water, and unless the curvature is sufficient these tracks are quickly deepened into water-courses which cut into and sometimes destroy the best improved road.

GOOD ROADS AT A COST OF $150 TO $200 PER MILE. THE RESULT OF MIXING SAND AND CLAY IN CRAVEN COUNTY.

The following interesting letter gives some information of value upon the above subject:

NEWBERN, N. C., Sept. 25, 1902.

DEAR SIR:—I am pleased to report that the experiment of building roads by the mixture of sand and clay has proven very successful in this county (Craven), and the results are highly satisfactory. Five weeks ago we commenced work with this method and we now have two miles of road graded to a uniform width, thoroughly ditched, with lead ditches to take off all the water from the road. We realize that this matter of drainage is one of the most essential features of road building.

A mile and a quarter of the road has been clayed to a depth of 12 inches, with good clay (this was formerly a sand road), and two or three inches of sand spread over the clay. For some time the travel cut and rutted the road and made a very rough surface, but it is now packing and becoming hard, and requires very little attention, smoothing up and placing more sand where needed. The first half mile laid is now a good, hard, substantial road. It produces a feeling, very much like macadam road in riding over it.

The cost of this piece of road is much greater than it otherwise would be on account of the distance we were compelled to haul the clay, in fact the cost of hauling the clay was fully eighty per cent of the entire cost of building the road.

About $600 per mile is the total cost of building this road, but other roads in the county, nearer the supply of clay, can be just as satisfactorily built for $150 to $200 per mile.

We are very much pleased with the sand-clay process and are extending the work as fast as is possible under the circumstances.

Yours truly, WILLIAM DUNN.

In almost any of the eastern or middle counties of North Carolina, where a good supply of clay is obtainable, the cost of building these sand-clay roads should not exceed $150 to $250 per mile, and when we consider their wearing and lasting qualities (20 to 25 years), it will be easy to recognize their great economy to our people.

KEEPING SWEET POTATOES.

DEAR SIR:—The Commissioner of Agriculture has sent me your inquiry about keeping sweet potatoes, and asking me to reply. There is no great difficulty in keeping them if handled right. In the first place dig in dry sunny weather, and in the digging, handle them as carefully as eggs. Never allow them to be thrown into piles, but leave them lying along the rows as dug to sun until evening; then gather carefully in boxes or baskets, never in bags, nor thrown into a cart body to be shovelled out. If the potatoes are grown on a large scale for market, it will pay to construct a potato house, or if where tobacco is grown a good tight tobacco barn with furnace and flues will answer very well. Put slatted shelves in the barn, and place the potatoes on them not over two feet deep. When all are in they will soon begin to sweat. Now, start the fire and run the temperature up to nearly 100 degrees, opening the ventilator to let the steam out. Fire some daily till the potatoes are dried off from the sweat, and then simply look after them in very cold weather and make a little fire now and then in cold evenings so that the temperature never goes lower than 50 degrees, and you will have no trouble with the potatoes. In warm spells open the ventilator. A regular potato house is built twelve feet wide and as long as needed, with ventilators along the crown of the roof and the walls and roof packed with sawdust. A furnace in one end and a brick flue through the middle of the house. Shelves on each side the central passageway over the flue. The brick flue is better than the tobacco flue, as you can make a moderate fire in cold evenings and heat the flue well, and it will retain heat enough through the night. The principle is to get the sweat dried off as soon as possible with a high temperature, and then to see that they are kept dark and not under 50 degrees. They can be kept in banks, and I have kept them in this way till June, perfectly sound. The banks should be made under shelter. Any sort of a rough board shelter in a sunny place screened from the cold winds will answer. During dry weather get ready plenty of pine straw and put it under cover. When banking, place a thick layer of straw on the ground and pile the potatoes in conical heaps, not over 25 bushels in a heap. Then cover each heap the length of your arm thick with pine straw and leave them thus till the weather threatens to get cold; then cover the heaps thinly with earth, except a small space at the top to let the steam off. As the weather gets colder cover thicker till all is covered over six inches deep with dry earth. Dry earth kept dry will keep out far more cold than wet soil, and the cover of board over the banks will keep it dry. The important point in harvesting is to get them out as soon as the vines are nipped, and if not suitable to dig then, always take the vines off, as the decaying vines will communicate rot to the roots. If potatoes are handled in this way there will be little trouble. A gentleman in South Carolina, to whom I sent plans for a sweet potato house, told me the following August that he had so many old potatoes he was then feeding them to hogs. If potatoes are bruised in digging or handling they will rot under any treatment.

W. F. MASSEY.

CONDITIONS INFLUENCING THE DIGESTION OF FOOD.

When a plant is young and tender it is agreeable to the taste of the animal. There is woody tissue in this state of growth, which suggests a more favorable condition for digestion and assimilation in the animal system. Besides, it is reasonabe to suppose an appetizing ration would be more readily appropriated than one which neither tempts the taste nor increases the appetite. Many a feeder owes his success to his ability in preparing the food places before his animals in a wholesome and agreeable manner. Hunger will make the animals partake of the food set before them, but nothing the feeder can do will make these same animals eat a quantity of unappetizing food sufficient for maintenance and profitable growth or milk production, and since growth and production result from food consumed it follows that flavor and taste are important, even though they add nothing to the energy or building capacity of a feeding stuff.

In a general way it may be said also, that an animal will digest as high a per cent of food eaten when it is eating its full capacity as when placed on but half the quantity it might be able to eat. Rapid growth and full milk flow therefore follow when the animal eats large quantities of food, showing again that palatableness is quite necessary for the most profitable feeding.

THE PREPARATION OF FEEDING STUFFS.

Since the reader is concerned in the highest digestibility of his feeding stuffs, he is interested in their preparation to produce the most economical returns. While it is true that many things can be done to increase the digestibility of food, it does not always follow it is good business management to do so. For instance, the grinding of food may mean a saving of eight or ten per cent; yet the labor of hauling to and from the mill and the cost of grinding may mean a less saving in the end. Every feeder must determine these factors for himself, for no set and dried rules will apply to all alike. Quite a number of feeding experiments have been made to determine the effect of grinding on the digestibility and practically all have shown more or less marked gains. Ruminants, as a rule, are more likely to masticate their foods in a thorough way, yet the feeder knows that many whole kernels of corn often are avoided in the feces.

STEAMING AND COOKING FOODS.

A great many devices are on the market for the preparation of materials for feeding the various classes of farm animals. The labor and expense connected with the practice is usually unwarranted and uneconomical.

Professor Jordan, in discussing the matter, says: "The conclusions of German experimenters have been that these special treatments" (such as wetting, steaming, cooking and fermenting) "have no favorable influence, their effort being either imperceptible or unfavorable. The extensive trials by Kuhn and others with hay and bran ration, the bran being fed in several conditions, such as dry, wet, moistened some hours before feeding, treated

with boiling water and fermented, gave results adverse to all the special methods of preparation as either useless or harmful, and no testimony so thorough and convincing has been furnished on the other side."

THE FEEDING OF POULTRY.

The various kinds of farm poultry have much to do with furnishing the food supply of the world. As the population increases the importance of this industry will likewise increase and the feeding of poultry become a more delicate art.

The best philosophy in feeding is to look well after the young. This applies to every class of farm animals, for, when the young has been started with vigorous and healthy growth, quick maturity and economical gain follow.

FEEDING THE LITTLE CHICKENS.

One should not be in too great a hurry to feed the little chickens. A day or two can go by after hatching before feeding. When food is first given it should be of a nature to be easily digested without the aid of grit. Perhaps the best food for the early feeding is stale bread, slightly moistened with milk. Fresh bread is not desirable. In a few days ground grain can be added to the feeding ration, such as corn meal, wheat bran and wheat middlings. Sour milk or sweet milk are excellent to go with these.

At first, feed often. As the young chickens increase in size, the number of feedings can be diminished and the quantity of food increased.

GREEN FOOD NEEDED.

Green food should be provided early. If young chickens are permitted to run in the orchard and grass yards they will find worms and insects and peck away at the grass blades, thus getting for themselves what they need of these materials. If it is not possible to provide feeding yards, as indicated above, the grower should have small pens, in which are seeds, rye, grasses, rape, or other forage crops, to furnish the necessary succulent for greatest vigor and growth.

FEEDING FOR EGGS.

There are many wholesome foods that can be given, but a careful selection of those most suited for egg production will pay.

It should be remembered that eggs are made principally of protein, consequently the feeding ration should contain an abundance of this material. If one goes to nature to get his teachings he finds that poultry are busy gathering seeds, grasses, worms and insects all the time. Let man furnish these materials, then, as much as he can. He may not have the worms and insects, but he can find on the market bone meal and green bone that becomes suitable substitutes for worms and bugs. Green food must also be provided in order to obtain the greatest production of eggs. If it is relished by the fowls, it matters little what kind of green food it is A small area sown to alfalfa or

rye and wheat will make a great deal of pasture and will show its value in the increased number of eggs produced.

The following feeding stuffs can be used with economy in feeding fowls for eggs:

Corn,	Linseed meal,	Alfalfa,
Wheat,	Cotton-seed meal,	Clover,
Buckwheat,	Corn meal,	Beets.
Oats,	Gluten meal,	Cabbage,
Barley,	Meat and bone foods,	Rape.

FEEDING FOR MEAT.

In feeding for meat a ration to produce both lean meat and fat is desired.

Corn, oats, buckwheat and barley, one or more combined, with animal meal, will furnish a safe and economical fattening ration. The animal meal should form 10 to 20 per cent of the ration feed. Young animals, being fed for broilers, will do most satisfactory if given exercise in the early feeding periods. As they approach the marketing period, exercise can be finally eliminated; with older and mature fowls no exercise need be given. The aim should be to furnish food that is constantly relished so as to keep the appetite keen and good. For this reason a change in feeding stuff is desired.

FEEDING BREEDING STOCK.

Infertile eggs usually result where the breeding stock is too closely confined and fed foods lacking in succulent nature.

Feeding stuffs of similar nature as suggested for feeding young fowls will meet the requirements for feeding breeding stock.

C. W. BURKETT.

GINSENG.

Recently some imaginative newspaper reporters have been telling wonderful tales about the great profit to be derived from the culture of ginseng, and at once the Experiment Station has been flooded with letters of inquiry. We have been asked from all parts of the State to tell the inquirers all about ginseng culture. Now, as the Station has never made any experiments in ginseng culture, and the Horticulturist knows practically nothing about the culture, we can only tell what we have observed and know from others who have tried it.

In the first place, there is probably no chance for the plant to succeed in the warmer parts of this State. It grows wild in the western section, and has been collected and sold for many years from the mountain country. The sale of ginseng roots is entirely dependent on the demand for it in China. The Chinese imagine it to be a panacea for all the ills that affect mankind. The supply of the native variety in China has been largely exhausted and this has caused a demand for the American ginseng. Our ginseng is a different species from the Chinese. Theirs is known botanically as aralia shinseng, from which the common name ginseng is derived. Our plant is aralia

quinquefolia. But the roots are alike and serve the same purpose. It is a slow-growing weed of the mountain section and northward. It grows only as an under-herb in the shade of the forests in moist and cool localities. Efforts have been made in various parts of the country to cultivate the roots, and parties in New York State and elsewhere claim to be succeeding with it. But so far as we have been able to observe, they are not looking to the Chinese market, great as that is said to be, but are getting their profit from the sale of roots and seeds for planting. How many of the roots sold for planting have really been cultivated by the venders we can not say, but the chances are that all sold, both of roots and seeds, are gathered from the wild plants in the forest. Mr. H. P. Kelsey, at Linville, N. C., has experimented in the culture of this plant, but with what success I can not say. Those who claim to be cultivating ginseng agree that it is a slow-growing plant, and that it requires from five to eight years to make a marketable crop. It will not grow in the dry soil and open sunshine, but must be planted among the forest trees in a locality where it will not suffer from drought and where it can have a cool atmosphere. Under such conditions it is evident that the product, after digging and drying, must bring a large price to make it at all profitable, as compared with ordinary crops of the garden. I have studied all that I have been able to find on the subject, and have come to the conclusion that those who plant ginseng with the hope of great profit from the cultivation will, by the time they get a crop, wish that they had been growing five-cent cotton or two-cent tobacco.

W. F. MASSEY.

THE VALUE OF BIRDS TO NORTH CAROLINA AGRICULTURE.

IMPORTANCE AS INSECT DESTROYERS—THREE HUNDRED SPECIES NOT PROTECTED BY LAW—RECKLESS DESTRUCTION OF OUR FEATHERED FRIENDS.

To those who have thought but little concerning the practical value of birds to man, it may be a new idea that their usefulness is a very pronounced reality; this usefulness lies chiefly in the service they render as destroyers of insects which are injurious to vegetation, as consumers of small rodents, as destroyers of large quantities of seeds of noxious plants, and as scavengers. Birds constitute the chief force in keeping down the surplus number of insects which otherwise would be far more destructive to the agricultural products of the country. As matters now exist, one-tenth of the entire agricultural product of the United States each year is a total loss through the inroads of insects, and we are told that owing to the decreasing number of birds, this percentage is annually increasing. The work which birds do simply as preventatives is enormous.

The young of some species eat more than their own weight of insect food daily. The adult birds of many kinds subsist chiefly on an insect diet, and two-thirds of the varieties found in North Carolina are almost wholly insectivious. Birds digest their food so rapidly that it is difficult to estimate the real amount which they consume. It is known, however, that a swallow will eat six or seven hundred flies in a day. The stomach of a cuckoo shot at 6 o'clock in the morning contained twenty-three tent-caterpillars partly di-

gested; how many would have been destroyed by evening can not well be estimated. The stomachs of chickadees not infrequently have been found to contain over two hundred eggs of the canker worm, and as many as twenty-five of the female moths, each holding over one hundred eggs. It has been estimated that during the one month that these insects infest the trees, each chickadee would destroy over 130,000 eggs. A pewee, which I once watched, captured sixteen insects during a period of ten minutes. The bird would dart out a few yards, seize a passing insect and return at once to her lookout perch. When some hours later I again saw the bird, she was still busy at her work.

The real value of birds as insect destroyers has not been appreciated generally. One reason for this is that their work is not apparent to the casual observer, who rarely sees a bird except when it is alarmed, and, therefore, is not feeding. Superficial observation has been a cause for much sufferings to birds, and a great pecuniary loss on the part of observers.

We, as a people, have failed to observe carefully the feeding habits of our feathered friends, and thus have not learned their intrinsic value. For the same reason we have not been sufficiently interested in their preservation to enact adequate laws for the protection of non-game birds. There have been recorded in North Carolina 312 species of birds. Three hundred of these species are not protected by the laws of the State, except in a few counties. Public sentiment is so lax in many sections that these laws are really little better than no law at all.

There is scarcely a bird within the limits of our Commonwealth that is not regarded as a legitimate mark for any gun. Numbers of men and boys in almost every section of the country at times shoot non-game birds indiscriminately. Thousands of chimney swifts, swallows, martins and night-hawks (bullbats) are shot every summer "just to see them fall." The small boy plunders the nests of their eggs for his "collection," and does so unrestrained by parental authority. Our sea birds have been almost exterminated by the plume hunters, who gather the feathers for the great millinery houses. In some sections of the central and eastern portions of the State thousands of young mocking birds are annually taken from their nests by people who attempt to rear them by hand as singers for the ever-ready Northern and Western markets. Irresponsible parties wandering about the fields, without the least instincts of sportsmanship, shoot woodpeckers, redbirds, sparrows and thrushes. Only a short time since I heard a gentleman complaining that he had seen a boy shooting mocking birds in the cemetery of one of our chief cities. The boy said he "was trying to see how many birds he could kill in an hour." This kind of thing has gone on too long. Many observing people will testify that the common birds are not as numerous in their sections as in former years.

The problem with which nature is confronted, of adjusting the habits of her wild creatures to meet the changing environments occasioned by the advancement of civilization into the wilderness, is a stern one. When, therefore, man adds to her difficulties by causing the wholesale destruction of any particular form of wild life, the rapid falling off in numbers of the persecuted necessarily follows. The alarming decrease of the number of birds in the United States of recent years has been the occasion of much anxiety to the minds of

thoughtful persons. Many States have already passed laws for the protection of their birds, and there are those who believe that the people of North Carolina will not longer consent to see their innocent and valuable friends wantonly slaughtered by thoughtless and vicious men and boys.

T. GILBERT PEARSON.

Guilford County, N. C.

FAYETTEVILLE AS A TRUCKING FIELD.

Complying with your request to send statistics of our fruit and trucking development in this section, I beg to submit that our lands are not only well adapted to growing fruit and truck of all kinds, but of corn, cotton and small grain, profitably. Since we have unusual shipping facilities, being within 24 hours by *freight train* schedule to Northern markets, our dewberry crop has been pushed forward, and at this time we have within a radius of five miles from this station, over 200 acres of the Lucretia variety, from which were shipped last season 21 cars by freight and 2,570 crates by express; also, 5,712 baskets of English peas were shipped by express, and during June and July 2,138 crates cantaloupes. Because of our near-by markets, rapid transportation and satisfactory refrigerator car service, we are enabled to get our products on the markets in the best condition, and, consequently, command the highest prices; so there need be no surprise that good profits can be shown. In proof of this I append the following statement, furnished by Mr. Fitzell, of "Zellmoor" farm, which is located on Haymount, a western suburb of Fayetteville, within one and three-fourth miles of our depot: This farm contains 55 acres, 47 of which are under cultivation, being planted principally in dewberries, strawberries, asparagus, lettuce and cantaloupes, with 400 plumb trees; but from this farm, from 1st January to 1st August, last year, gross sales show, $5,290.86; deducting expenses of fertilizer, cultivation, freights and commissions, $3,065.22, net profit, $2,225.64.

Proofs as to correctness of these figures can be shown by account of sales and with blank checks to balance each account.

A neighbor to the "Zellmoor" farm can show net cash receipts of $75.00 from about one acre cultivated in cantaloupes.

We are willing to show to the world what we are doing and can do, for we do not fear competition. Since we are especially favored in this section by conditions, those who would do as well must come here and locate, and this we invite all good people to do, and we will see that they can get good lands at reasonable prices near enough to the railroads to make shipping profitable. There need be no fear of over-stocking the markets, as we have so many millions of people in cities within reach who must have our products, and by producing a larger scale, enable our transportation companies to give us still better facilities and furnish special trains of refrigerator cars, which we should load with our products from this station. However, we have reason to be much encouraged by the growth of this industry, which is comparatively new to this section.

We appreciate what your department is doing to advertise the resources and possibilities of this wonderful State and feel that the prospective settler will

be indebted to you and to us for showing him where to come to find health, prosperity and happiness.

Yours very truly, NEWTON H. SMITH.

RICH STRAWBERRY PATCH.

Mr. R. S. Perry, in a letter to the Raleigh *News and Observer*, tells of his experiences in raising strawberries as follows:

"On the three-quarters of an acre mentioned I harvested thirty-five barrels, or 175 bushels, thirty-two quart baskets to the bushel, or 160 quarts to the barrel, or 5,600 quarts from the three-quarters of an acre, and sold for $309.54; add to this sum for the other one-quarter of an acre 1,866½, making a total of 7,466 2-3 quarts. I therefore received a small fraction above five and one-half cents per quart. As for the loss, it would be incredible if told. There were seven families engaged in picking, all of whom were for three weeks allowed to gather at will for their families."

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